EPA REGION V ARCS PROGRAM
EPA Contract No. 68-W8-0093
Work Assignment No. 17-5L4J
SEC Donohue Project No. 20026

VOLUME 2

FINAL FEASIBILITY STUDY REPORT
APPENDIX A - TECHNICAL MEMORANDA
APPENDIX B - DETAILED COST SUMMARIES
FOR
HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA

SEPTEMBER 1992

Prepared for:

U.S. Environmental Protection Agency
Emergency and Remedial Response Branch
Region V
77 West Jackson Boulevard
Chicago, Illinois 60604

SEC DONOHUE INC.
in association with

Life Systems, Inc.
Environmental Engineering & Remediation, Inc.

APPENDIX A

TECHNICAL MEMORANDA

LIST OF TECHNICAL MEMORANDA

HIMCO DUMP
SUPERFUND SITE

A1	Thickness of the Calcium Sulfate Layer
A2	Calculation of the Permeability of the Calcium Sulfate
A3	Leachate Collection System
A4	Leachate Generation Rate in the Landfill
A5	Rate of Landfill Gas Generation
A6	Cap Construction
A7	Proposed Preliminary Groundwater Monitoring Program
A8	Proposed Levels of Contaminants of Concern Which Would Trigger a Groundwater Study at the Himco Site
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A10	Determination of the Zone Requiring Institutional Controls for Groundwater Use

APPENDIX A1

Thickness of the Calcium Sulfate Layer

TECHNICAL MEMORANDUM A1

DATE: July 15, 1992

TO: Himco File

FROM: Mehdi Geraminegad

SUBJECT: Thickness of the Calcium Sulfate Layer
Himco Dump Superfund Site
Elkhart, Indiana

Average thickness of the calcium sulfate layer was determined using data from the test pits performed during RI in the landfill. According to this data, the land fill area can be divided in two zones, A and B, depending on the thickness of the calcium sulfate layer. Zone A encompasses an area with calcium sulfate thickness ranging from 0.5 to 1 foot. Zone B encompasses an area with calcium sulfate thickness ranging from 1 to 8 feet. Zone A encompasses an area of approximately 1,345,224 square feet and zone B encompasses an area of approximately 733,125 square feet (see attached figure).

Based on the above information and for estimating the rate of leachate generation, the average thickness of calcium sulfate layer was assumed to be 9 inches and 48 inches for zones A and B respectively. These thicknesses were used in the Hydrological Evaluation of Landfill Performance (HELP) model for estimating the rate of leachate generation in the landfill.

A/R/HIMCO/AS1

8 7 6 5 4 3 2 1

LEGEND

TL-1, ETC.	TEST PIT
TD-4	DELINEATION TRENCH
TL-3	LEACHEATE TRENCH
●	LEACHEATE SAMPLE COLLECTED FROM THIS TRENCH

— LANDFILL BOUNDARY

ZONE A : AVERAGE $CaSO_4$ THICKNESS = 9" (0.75')

ZONE B : AVERAGE $CaSO_4$ THICKNESS = 48" (4')

ZONE A

ZONE B

$CaSO_4$ = 1' / T-19

TL-1 $CaSO_4$ = 0.5' T-18

$CaSO_4$ = 5' / T-9

$CaSO_4$ = 1' / T-14,15

$CaSO_4$ = 10' / T-20

$CaSO_4$ = 1' / T-16

TL-5

$CaSO_4$ = 0.5' T-17 TL-2

$CaSO_4$ = 6' T-10,11

TL-6

TD-1 / T-12,13 $CaSO_4$ = 8'

TD-6

TD-3

T-5,6 $CaSO_4$ = 5'

TL-3

TD-5

TD-4

$CaSO_4$ = 1' / T-1-4 7,8

TL-7

0 100 200 400

								By	Date
								Revisions	
								No.	
Scale	AS SHOWN								
Date	JAN. 1992								
Designer	SP								
Drafter	EZ								
Checker									
Approver									

Donohue ENGINEERS ARCHITECTS SCIENTISTS

FIGURE 2-2
TRENCH LOCATIONS
HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA

Sheet No.

Qty. Loc. | File No.

PHASE 2

Drawing No. 2-2 O

APPENDIX A2

Calculation of the Permeability of the Calcium Sulfate

CONSOLIDATION TEST RESULTS
(ASTM D2435)

PROJECT: SAS 5993E SML / TETC NO. : 91-212-3108

CLIENT PROJECT NO.: 5993E CLIENT : VIAR COMPANY

REPORT DATE : Feb. 18, 1991 SUMMARIZED BY : S. Sayawatana

SAMPLE NO. : HD K 14-01 DEPTH : N/A ft.

INITIAL DRY DENSITY : 1.46 gm/cc INITIAL MOISTURE CONTENT : 34.0 pct.

INITIAL VOID RATIO : 0.816

SPECIFIC GRAVITY : 2.65 (assumed)

Fig. 1

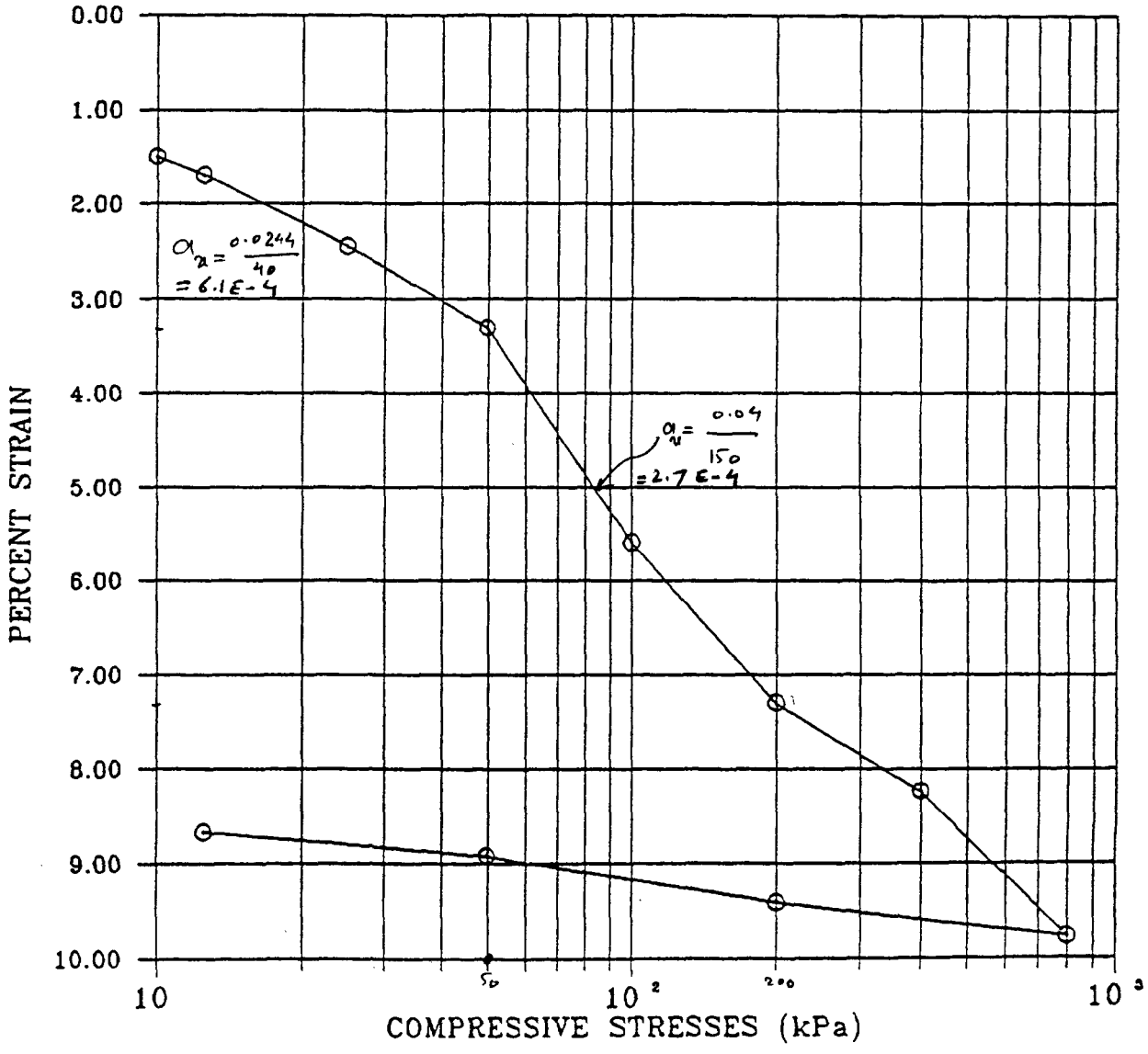


TABLE 1

SUMMARY

OF

CONSOLIDATION TEST RESULTS

(ASTM D2435)

PROJECT NAME:	SAS 5993E	TETC #:	91-220-3108
CLIENT PROJECT NO.:	SAS 5993E	CLIENT:	VIAR COMPANY
REPORT DATE:	Feb. 18, 1991	SUMMARIZED BY:	S. Sayawatana
LABORATORY MANAGER :	(Arul) K. Arulmoli		

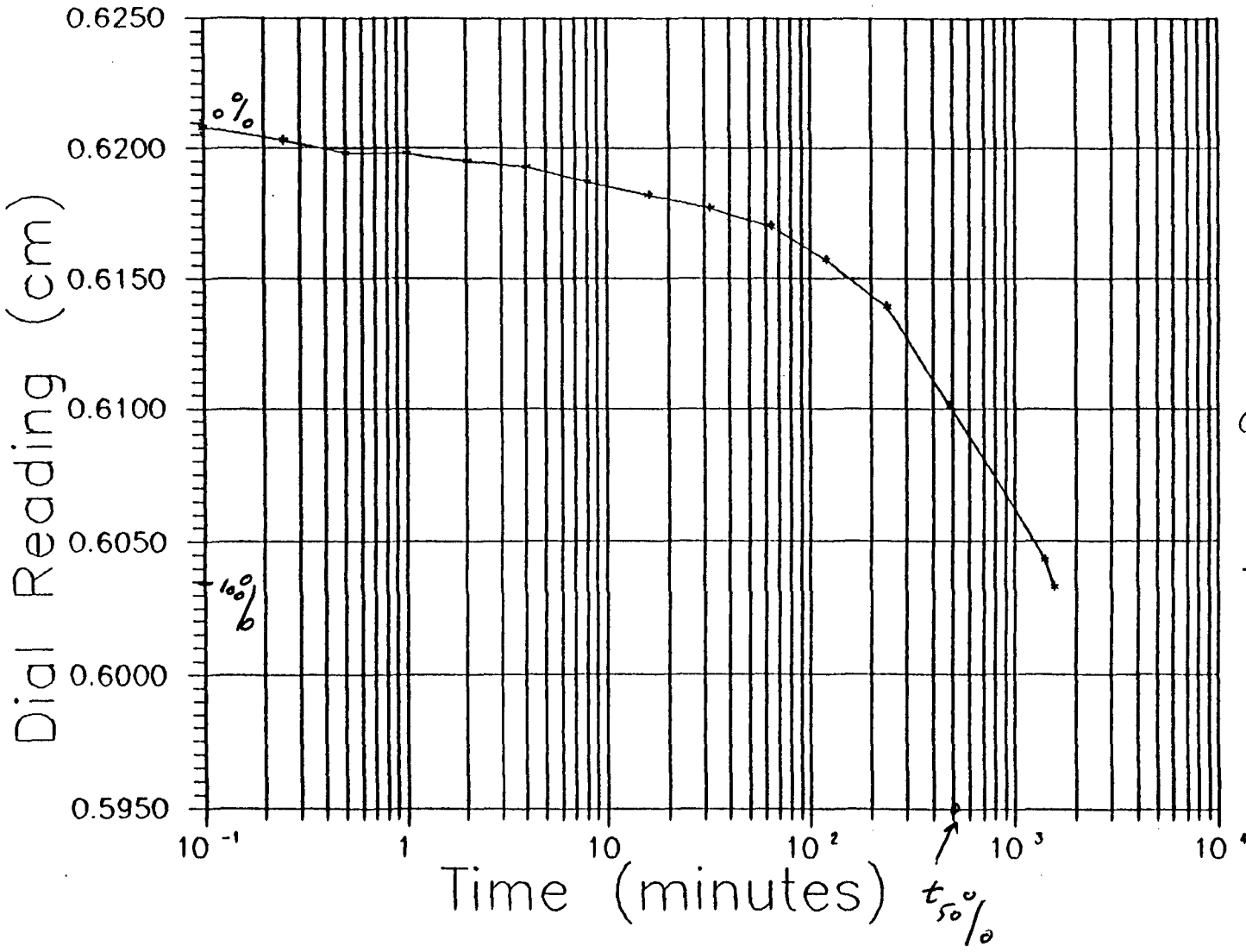
Sample No.:	HD K 14-01	Depth (ft.) :	N/A	
Dry Density (pcf):	1.46	Specific Gravity:	2.65	(Assumed)
Initial Moisture (%):	34.40	Final Moisture (%) :	32.20	
Initial Length (cm):	2.5400	Initial Void Ratio (%)	81.6	
Initial Reading(cm):	0.6665			

PRESSURE (kPa)	FINAL READING (cm)	THICKNESS (cm)	VOID RATIO	STRAIN % OF SAMPLE THICKNESS	LOAD COMPLIANCE (%)	CORRECTED STRAIN (%)
12.50	0.6228	2.4963	0.785	1.72	0.02	1.70
25.00	0.6033	2.4768	0.771	2.49	0.05	2.44
50.00	0.5801	2.4536	0.754	3.40	0.10	3.30
100.00	0.5032	2.3767	0.699	6.43	0.16	6.27
200.00	0.4745	2.3480	0.679	7.56	0.26	7.30
400.00	0.4475	2.3210	0.659	8.62	0.38	8.24
800.00	0.4054	2.2789	0.629	10.28	0.50	9.78
200.00	0.4194	2.2929	0.639	9.73	0.31	9.42
50.00	0.4359	2.3094	0.651	9.08	0.16	8.92
12.50	0.4442	2.3177	0.657	8.75	0.08	8.67

Figure 2

CONSOLIDATION TIME CURVE

BORING NUMBER: *SAMPLE NUMBER: HDK14-01*
COMPRESSIVE STRESS 25 KPa



50%

$= \frac{0.6208 - 0.6035}{2} = 0.612$

$t = 500$ min
50%

$C_v = \frac{T_{vl} H^2}{t} = \frac{0.197 * 2.477^2}{4 \times 500 * 60}$

$= 1 * 10^{-5}$

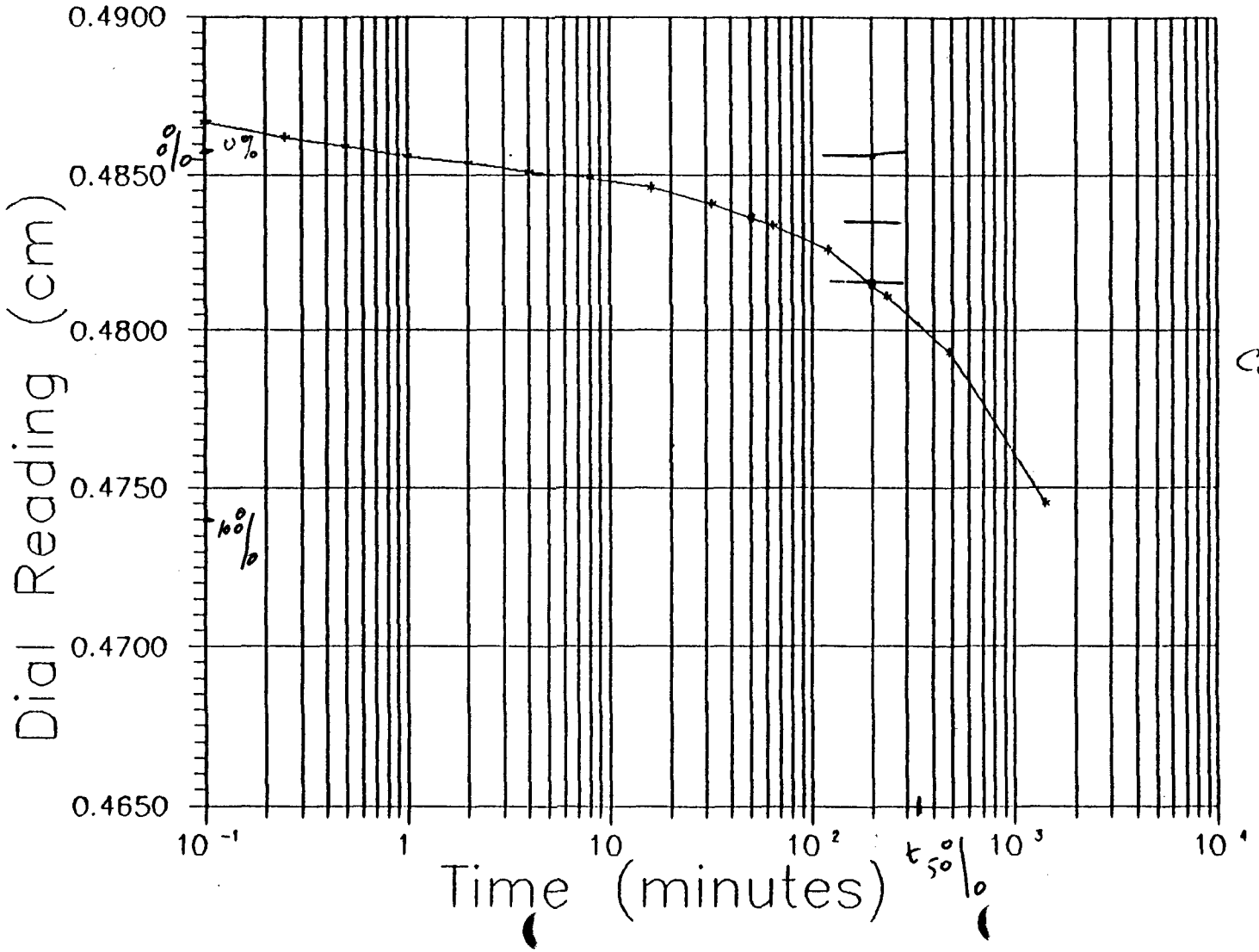
T_{vl} from Consolidation curve for 50% Consolidation

$H = 2.477$ from Table 1

Figure 3

CONSOLIDATION TIME CURVE

BORING NUMBER: SAMPLE NUMBER: HDK14-01
COMPRESSIVE STRESS 200 KPa



$t_{50\%} = 350$ min

$C_v = \frac{T_v H^2}{t} = \frac{0.197 * 2.38^2}{4 * 350 * 60}$

$= 1.31 * 10^{-5}$ cm²/sec

Calculation of the Permeability Value for the Calcium Sulfate Layer from Consolidation Test Results

DATE: 6/8/92
FROM: MEHDI GERAMINEGAD

The permeability coefficient (K) can be calculated using the following equation:

$$K = C_v \gamma_w m_v$$

where,

C_v is the coefficient of consolidation,
γ_w is the water density, and
m_v is the volumetric compressibility coefficient

Permeability values were calculated for various effective stress levels (effective stresses of 25 KPa and 200 KPa)

I. Compressive stress = 25 KPa (see figure 1)

a_v = compressibility coefficient $\frac{de \text{ (void ratio)}}{dp} = 6.1 \times 10^{-4}$ 1/KPa

C_v = coefficient of consolidation = (time factor) $\frac{T_v H^2 \text{ (sample thickness)}}{t \text{ (time)}}$

for 50% consolidation, $T_v = 0.197$

$$C_v = \frac{0.197 * (2.477)^2}{4 * 500 * 60 \text{ sec.}} = 1 * 10^{-5} \text{ cm}^2/\text{sec.}$$

(see Figure 2)

I. (cont.)

K (permeability) $= C_u \gamma_w m_u$

$m_u = \frac{a_u}{1+e_o} = \frac{2.6*10^{-4}}{1.771}\ /KPa = 1.47*10^{-4}\ 1/KPa$

$K = 1.0*10^{-5}\ cm^2/sec * \gamma_w * m_u$

$\gamma_w = 1\ gm/cm^3$

$1\ KPa = 1000 * 0.1\ kg/m^2 = 100*1000\ gm/10^4\ cm^2 = 10\ gm/cm^2$

$K = 1.0*10^{-5}\ cm^2/sec * 1\ gm/cm^3 * 1.47*10^{-4}\ 1/KPa \Rightarrow 10\ gm/cm^2$

$K = 1.47*10^{-10}\ cm/sec$

II. Compressive strength = 200 kPa

a_u = compressibility coef. (from Fig. 1 & Table 1) $= \frac{0.04}{150} = 2.67\times10^{-4}\ /KPa$

$a_u = 2.67*10^{-5}\ cm^2/gm$

C_u = consolidation coef. (from Fig. 3) $= 1.31*10^{-5}\ cm^2/sec$

(Note: C_u for the compressive strength of 25 KPa is $1*10^{-5}\ cm^2/sec$, Fig. 2)

m_u = volumetric compressibility coef. $= \frac{a_u}{1+e_o} = \frac{2.67*10^{-5}}{1.679} = 1.59$

$K = C_u \gamma_w m_u$, $1\ KPa = 10\ gm/cm^2$

$K = 1.31*10^{-5} cm/sec * 1\ gm/cm^3 * 1.59*10^{-5} cm/gm = 2.1*10^{-4}$

TECHNICAL MEMORANDUM A2

DATE: July 1, 1992

TO: Himco Project File

FROM: Mehdi Geraminegad

SUBJECT: EPA ARCS Region V Contract No. 68-W8-0093
EPA Work Assignment No. 17-5L4J
SEC Donohue Project No. 20026
Calculation of Permeability of the Calcium Sulfate Layer
Himco Dump FS

The permeability of the calcium sulfate layer at the Himco site was estimated using the consolidation test results conducted during the RI on a sample from this layer. The sample used for this test was HDK14-01; it was collected from the surface soil at the location of sample GS-04 situated within the landfill at N1532400, E406300 coordinates. The methodology for estimating the permeability value is presented in the attachment. The following section presents a summary of the results.

The permeability of the calcium sulfate layer was estimated at 1E-10 cm/sec range. This permeability value is the range for shale fragments (Freeze and Cherry, Groundwater, Prentice Hall, Inc.).

The reasons for the very low-calculated permeability value cannot be precisely identified. Part of the problem may be stemmed from the chemical interaction between the soil (calcium sulfate) and water media which is not considered in a typical consolidation theory. Consolidation is a physical reaction by which moisture within the soil particle seeps out due to the generated excess pore pressure. The chemical reaction between calcium sulfate and groundwater may create another dimension to the consolidation, which cannot be evaluated with the conventional consolidation theory. Other factors, such as sample initial moisture condition and sample preparation and remolding for the consolidation test, may be responsible for the low estimated permeability value. A further evaluation of these variables is beyond the scope of this investigation.

In addition to the use of the consolidation data, the permeability value for the calcium sulfate layer was estimated based on the grain size distribution of sample HDK14-01 from this layer. The grain size distribution curve for this sample is included in the attachment. Based on this curve, clay sized particles constitute 10% and silt and clay sized particles constitute 98% of this sample. This sample may be classified as ML in the Unified Soil Classification System. The permeability of this sample, based on the grain size distribution, is estimated at 1E-5 range.

Because the in-situ permeability of the calcium sulfate layer cannot be reliably estimated based on present data, values ranging from 1E-5 to 1E-10 can be considered for permeability of this layer. A value of 8.5 E-7 was used for estimating the leachate generation rate at this site.

A/R/HIMCO/AT3

APPENDIX A3

Leachate Collection System

TECHNICAL MEMORANDUM A3

DATE: July 30, 1992

TO: Himco File

FROM: Mehdi Geraminegad

SUBJECT: EPA ARCS V
Himco Dump Superfund Site, Elkhart, Indiana
SEC Donohue Project No. 20026

Leachate Collection System

Eliminating leachate infiltration to groundwater was considered as a response action to mitigate groundwater contamination at this site. Because the bottom of the waste in the Himco site is in direct contact with the site groundwater, a leachate collection system consisting of a series of vertical wells covering the entire area was considered for this site. The attached calculation sheets present assumptions and analytical procedures to estimate the optimal leachate well spacing. Based on this calculation, the optimal spacing between leachate wells was calculated to be 56 feet and the total required number of leachate wells were estimated to be 680 wells.

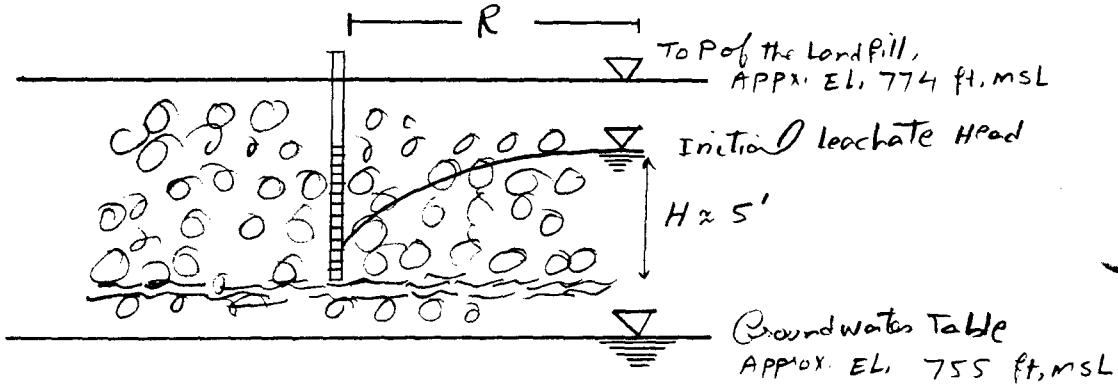
PRELIMINARY DESIGN FOR THE LEACHATE COLLECTION SYSTEM

1. Estimation of the Number of Wells

In most landfills an aquitard exists under the landfill which separates the waste mass from the groundwater aquifer. In these landfills leachate wells are installed and pumped along the perimeter of the landfill to minimize off-site migration. Leachate wells may be either perimeter vertical wells or perimeter horizontal drains which are both effective in capturing the leachate. However, these conditions do not exist at the Himco site. At the Himco site, there is no aquitard to isolate the waste mass from the aquifer and the waste mass is in communication with groundwater at least part of the year. Under this condition, vertical wells distributed throughout the whole landfill area were considered to be the best option to capture leachate from the landfill.

Based on the above discussion, it is assumed that leachate wells will be distributed uniformly throughout the landfill area. It is also assumed that the leachate wells will extend to 2 feet above the site natural groundwater table (see figure below). In order to estimate optimal spacing between wells, radius of influence (R) was calculated for each well using an empirical equation (see Section 2). The well spacing was calculated between 15 and 47 feet. Using the radius of influence of 28 feet, the number of wells within the landfill was estimated to be 680 wells:

Number of leachate wells = landfill area = 2,100,000/56*56) = 680 wells



2. Estimation of the Radius of Influence of the Wells

According to the test pit results, leachate was encountered at 3 feet to 5 feet below surface. Assuming that the initial leachate head (H) would be approximately 5 feet, then the radius of influence may be calculated using:

R = CH SQRT(K)

Source: Foundation Eng Haynes Davis 1962 McGraw Hill Series in Soil

where

K is permeability value in 10^{-4} cm/sec and C is a coefficient ranging from 1.5 to 3

Assuming K ranges from 10^{-4} cm/sec to 10^{-3} cm/sec and C = 3, the radius of influence was calculated to be:

R = 15 feet to 47 feet, say 28 feet

Based on the above calculations, well spacing of 56 feet (2 x R) was selected as the optimal spacing between wells.

A/R/HIMCO/AS9

APPENDIX A4

Leachate Generation Rate in the Landfill

TECHNICAL MEMORANDUM A4

DATE: July 15, 1992

TO: Himco File

FROM: Parvaneh Shakki/Mehdi Geraminegad

SUBJECT: Leachate Generation in the Landfill
Himco Dump Superfund Site
Elkhart, Indiana
Project No. 20026.040

Introduction

SEC Donohue has made an estimate of the leachate generation rate in the landfill in order to evaluate the selected remedial alternatives at the Himco site. The results of this evaluation have been used to compare the four alternatives presented in the FS in terms of their impacts to the aquifer. This evaluation has been used for cost estimating for leachate removal which is a component of Alternative 3. The following cases were studied:

1. No action (Alternative 1)
2. Single barrier solid waste (Alternatives 2 and 3)
3. Composite barrier solid waste cap (Alternative 4)

The Hydrogeologic Evaluation of Landfill Performance (HELP) model was used for estimating the leachate generation rate in the landfill. This memorandum presents a summary of this modeling work.

Basics about the HELP Model

The Hydrologic Evaluation of Landfill Performance (HELP) model is a quasi-two-dimensional deterministic water budget model. The HELP program requires three general types of input data:

1. Climatological data (i.e., temperature, precipitation, etc.)
2. Soil data (i.e., permeability, volume water content, etc.)
3. Design data (i.e., cap thickness, number of layers, etc.)

Using the input data, the program performs a sequential daily analysis to determine runoff, evapotranspiration, barrier-layer percolation and lateral drainage for the landfill.

For climatological data the user may choose one of the three following options:

1. Default precipitation
2. Manual precipitation
3. Synthetic precipitation

The model contains parameters for generating synthetic precipitation for 139 cities. The historical database contains five years of daily precipitation data for 102 cities. Daily temperature and solar radiation data are generated stochastically.

To enter the soil data, the user may choose one of the default or manual options. The model contains default soil characteristics for 18 soil types for use when measurements or site-specific estimates are not available.

Other input data include such things as the maximum drainage distance for lateral drainage layers, surface cover characteristics, number of layers, slope and the maximum drainage length of the area.

Options Used in this Modeling

The following options were used in this modeling:

Data	Options
Climatological Data	Synthetic
Soil Data	Model Default Valves
Design Data	Entered manually based on the site condition.

Tables 1 and 2 provide the model's option types and other design data used in this modeling.

Estimation of Leachate Generation

For this simulation, the site was divided in two zones (zones A and B) based on the thickness of the calcium sulfate layer (see Technical Memorandum A1). Zone A encompasses an area of approximately 1,345,224 square feet and zone B encompasses an area of approximately 733,125 square feet. Table 2 presents design data specific to zones A and B. The infiltration rate was calculated for both zones. After all climatological and soil data are entered, the program ran a series of calculation in order to simulate the percolation and leachate generation into the landfill layers, for number of years requested. These values which represent five years of percolation and leachate generation into the landfill, are shown in Table 3.

Uncertainties

The errors listed below may occur in this numerical simulation. However, it is anticipated that the resulting infiltration rates are accurate enough for most practical purposes.

1. Errors associated with the theoretical methodologies and numerical calculations used in the model.

2. Errors associated with hydraulic parameters (i.e. permeability values) used in the model.

3. Errors associated with climatological data (i.e., temperature, precipitation) used in the model.

4. Errors associated with the physical setting of the cap components (i.e., thickness of the clay layer, surface drainage condition) used in the model.

A/R/HIMCO/AR8

Table 1 Himco Dump Superfund Site*
Data Summary

Layer	Cap Layer**	Layer Type		Thickness		Infiltration Type
		Single Cap	Composite Cap	Zone A	Zone B	(For HELP model)
1	Vegetative	7	7	12	12	1
2	Barrier	15	16	24	24	3
3	Buffer	4	4	48	48	1
4	CaSo4	15	15	9	48	3

* See HELP manual for description of layer types.

** For the No Action case, vegetative layer is 1-inch; and $CaSo^4$ layer is 8-inch and 47-inch for zones A and B respectively. No other layer was considered for this case.

Table 2 Summary Data
for Zones A and B
(Existing Condition)

	Zone A	Zone B
Curve Number	87	81
Area (sq. ft)	1,345,224	733,125
Thickness of Calcium Sulfate (inch)	9	48

Table 3 Himco Dump Superfund Site
Annual Leachate Generation

	Zone A		Zone B		Total*
	(Inch)	(Cuft)	(Inch)	(Cuft)	(Million Gallon)
No Action (Existing Cover)	4.6	515,670	4	281,031	5.9
Single Cap	2.9	325,000	2.9	177,171	3.7
Composite Cap	0.001	112	0.001	61	0.001

Above estimations are made using HELP model

* Only half of the generated leachate will be collected by the leachate collection system in Alternative 3 of the FS.

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HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA, JULY 14, 1992
NO ACTION, ZONE B

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POOR GRASS

LAYER 1

VERTICAL PERCOLATION LAYER

THICKNESS	=	1.00 INCHES
POROSITY	=	0.4730 VOL/VOL
FIELD CAPACITY	=	0.2217 VOL/VOL
WILTING POINT	=	0.1043 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2217 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000935999968 CM/SEC

LAYER 2

BARRIER SOIL LINER

THICKNESS	=	47.00 INCHES
POROSITY	=	0.4224 VOL/VOL
FIELD CAPACITY	=	0.3495 VOL/VOL
WILTING POINT	=	0.2648 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4224 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000000850000 CM/SEC

GENERAL SIMULATION DATA

SCS RUNOFF CURVE NUMBER	=	81.00 — 733,125
TOTAL AREA OF COVER	=	~~610000~~. SQ FT
EVAPORATIVE ZONE DEPTH	=	20.00 INCHES
UPPER LIMIT VEG. STORAGE	=	0.4730 INCHES
INITIAL VEG. STORAGE	=	0.1244 INCHES
INITIAL SNOW WATER CONTENT	=	0.0000 INCHES
INITIAL TOTAL WATER STORAGE IN SOIL AND WASTE LAYERS	=	20.0745 INCHES

SOIL WATER CONTENT INITIALIZED BY PROGRAM.

CLIMATOLOGICAL DATA

SYNTHETIC RAINFALL WITH SYNTHETIC DAILY TEMPERATURES AND SOLAR RADIATION FOR INDIANAPOLIS INDIANA

MAXIMUM LEAF AREA INDEX	= 2.00
START OF GROWING SEASON (JULIAN DATE)	= 112
END OF GROWING SEASON (JULIAN DATE)	= 264

NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
26.00	29.90	40.00	52.40	62.50	71.60
75.10	73.20	66.60	54.80	41.80	31.50

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						

TOTALS	1.32	2.56	2.77	2.94	3.02	4.25
	2.35	3.16	3.35	2.93	2.68	3.47
STD. DEVIATIONS	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00

RUNOFF

TOTALS	0.446	0.764	0.920	1.467	0.355	1.271
	0.228	1.106	2.038	1.188	1.133	2.076
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

EVAPOTRANSPIRATION

TOTALS	0.615	0.918	1.877	1.325	2.187	2.617
	1.984	1.926	0.899	1.517	0.989	0.936
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

PERCOLATION FROM LAYER 2

TOTALS	0.2443	0.3481	0.5955	0.1591	0.3709	0.4073
	0.1551	0.2043	0.1154	0.3129	0.4511	0.6523
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 1

	(INCHES)		(CU. FT.)	PERCENT
PRECIPITATION	34.80	(0.000)	1769000.	100.00
RUNOFF	12.993	(0.000)	660497.	37.34
EVAPOTRANSPIRATION	17.790	(0.000)	904330.	51.12
PERCOLATION FROM LAYER 2	4.0164	(0.0000)	204168.	11.54
CHANGE IN WATER STORAGE	0.000	(0.000)	5.	0.00

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 1 *

	(INCHES)	(CU. FT.)
PRECIPITATION	1.90	96583.3
RUNOFF	1.441	73255.5
PERCOLATION FROM LAYER 2	0.0296	1505.1
HEAD ON LAYER 2	1.3	
SNOW WATER	0.74	37616.7

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.4730

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.0022

* Because total area of cover was adjusted, all numbers in this column should by multiplied by 1.2.

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FINAL WATER STORAGE AT END OF YEAR 1

LAYER	(INCHES)	(VOL/VOL)
1	0.12	0.1245
2	19.85	0.4224
SNOW WATER	0.00	

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HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA, JULY 14, 1992
COMPOSITE CAP, ZONE B

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POOR GRASS

LAYER 1

VERTICAL PERCOLATION LAYER

THICKNESS	=	12.00 INCHES
POROSITY	=	0.3808 VOL/VOL
FIELD CAPACITY	=	0.1924 VOL/VOL
WILTING POINT	=	0.1043 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1924 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000046800000 CM/SEC

LAYER 2

BARRIER SOIL LINER WITH FLEXIBLE MEMBRANE LINER

THICKNESS	=	24.00 INCHES
POROSITY	=	0.4300 VOL/VOL
FIELD CAPACITY	=	0.3663 VOL/VOL
WILTING POINT	=	0.2802 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4300 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000000100000 CM/SEC
LINER LEAKAGE FRACTION	=	0.00100000

LAYER 3

VERTICAL PERCOLATION LAYER

THICKNESS	=	48.00 INCHES
POROSITY	=	0.3394 VOL/VOL
FIELD CAPACITY	=	0.0906 VOL/VOL
WILTING POINT	=	0.0466 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0906 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000085000000 CM/SEC

LAYER 4

BARRIER SOIL LINER

THICKNESS	=	48.00 INCHES
POROSITY	=	0.4224 VOL/VOL
FIELD CAPACITY	=	0.3495 VOL/VOL
WILTING POINT	=	0.2648 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4224 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000000850000 CM/SEC

GENERAL SIMULATION DATA

SCS RUNOFF CURVE NUMBER	=	95.00 733,125
TOTAL AREA OF COVER	=	~~610000.~~ SQ FT
EVAPORATIVE ZONE DEPTH	=	20.00 INCHES
UPPER LIMIT VEG. STORAGE	=	4.5696 INCHES
INITIAL VEG. STORAGE	=	4.1819 INCHES
INITIAL SNOW WATER CONTENT	=	0.0000 INCHES
INITIAL TOTAL WATER STORAGE IN SOIL AND WASTE LAYERS	=	37.2528 INCHES

SOIL WATER CONTENT INITIALIZED BY PROGRAM.

CLIMATOLOGICAL DATA

SYNTHETIC RAINFALL WITH SYNTHETIC DAILY TEMPERATURES AND
SOLAR RADIATION FOR INDIANAPOLIS INDIANA

MAXIMUM LEAF AREA INDEX = 2.00
START OF GROWING SEASON (JULIAN DATE) = 112
END OF GROWING SEASON (JULIAN DATE) = 264

NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
26.00	29.90	40.00	52.40	62.50	71.60
75.10	73.20	66.60	54.80	41.80	31.50

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.06	1.75	3.02	4.59	3.59	4.41
	2.83	2.46	3.14	3.65	2.71	2.29
STD. DEVIATIONS	0.72	0.78	1.17	2.08	0.68	1.76
	1.96	1.05	1.64	2.10	1.34	0.80
RUNOFF						
TOTALS	0.900	0.661	1.100	1.392	0.993	1.077
	0.466	0.640	1.051	0.979	0.540	0.532
STD. DEVIATIONS	0.690	0.357	0.740	0.870	0.475	0.812
	0.671	0.534	0.690	0.981	0.713	0.479
EVAPOTRANSPIRATION						
TOTALS	0.819	1.433	2.397	3.141	3.063	4.922
	2.487	1.881	1.864	2.085	1.357	0.895
STD. DEVIATIONS	0.244	0.247	0.363	0.984	0.680	0.662

	0.997	0.770	1.099	0.407	0.305	0.257

PERCOLATION FROM LAYER 2

TOTALS	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000

PERCOLATION FROM LAYER 4

TOTALS	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5

	(INCHES)		(CU. FT.)*	PERCENT
PRECIPITATION	36.50	(4.500)	1855417.	100.00
RUNOFF	10.332	(2.829)	525189.	28.31
EVAPOTRANSPIRATION	26.345	(2.799)	1339191.	72.18
PERCOLATION FROM LAYER 2	0.0009	(0.0001)	47.	0.00
PERCOLATION FROM LAYER 4	0.0009	(0.0001)	47.	0.00
CHANGE IN WATER STORAGE	-0.177	(1.108)	-9010.	-0.49

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 5*

	(INCHES)	(CU. FT.)

PRECIPITATION	2.09	106241.7
RUNOFF	1.170	59458.6
PERCOLATION FROM LAYER 2	0.0000	0.3
HEAD ON LAYER 2	12.0	
PERCOLATION FROM LAYER 4	0.0000	0.3
HEAD ON LAYER 4	0.0	
SNOW WATER	1.49	75542.9

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.3808

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.1028

+ Because total area of cover was adjusted, all numbers in this column should be multiplied by 1.

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FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	3.30	0.2746
2	10.32	0.4300
3	4.35	0.0906
4	20.28	0.4224
SNOW WATER	0.00	

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HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA, JULY 14, 1992
NO ACTION, ZONE A

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POOR GRASS

LAYER 1

VERTICAL PERCOLATION LAYER

THICKNESS	=	1.00 INCHES
POROSITY	=	0.4730 VOL/VOL
FIELD CAPACITY	=	0.2217 VOL/VOL
WILTING POINT	=	0.1043 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2217 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000935999968 CM/SEC

LAYER 2

BARRIER SOIL LINER

THICKNESS	=	8.00 INCHES
POROSITY	=	0.4224 VOL/VOL
FIELD CAPACITY	=	0.3495 VOL/VOL
WILTING POINT	=	0.2648 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4224 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000000850000 CM/SEC

GENERAL SIMULATION DATA

SCS RUNOFF CURVE NUMBER	=	87.00
TOTAL AREA OF COVER	=	~~1119300~~ 1,345,224 SQ FT
EVAPORATIVE ZONE DEPTH	=	20.00 INCHES
UPPER LIMIT VEG. STORAGE	=	0.4730 INCHES
INITIAL VEG. STORAGE	=	0.1240 INCHES
INITIAL SNOW WATER CONTENT	=	0.0000 INCHES
INITIAL TOTAL WATER STORAGE IN SOIL AND WASTE LAYERS	=	3.6009 INCHES

SOIL WATER CONTENT INITIALIZED BY PROGRAM.

CLIMATOLOGICAL DATA

SYNTHETIC RAINFALL WITH SYNTHETIC DAILY TEMPERATURES AND SOLAR RADIATION FOR INDIANAPOLIS INDIANA

MAXIMUM LEAF AREA INDEX	= 2.00
START OF GROWING SEASON (JULIAN DATE)	= 112
END OF GROWING SEASON (JULIAN DATE)	= 264

NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
26.00	29.90	40.00	52.40	62.50	71.60
75.10	73.20	66.60	54.80	41.80	31.50

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						

TOTALS	2.06	1.75	3.02	4.59	3.59	4.41
	2.83	2.46	3.14	3.65	2.71	2.29
STD. DEVIATIONS	0.72	0.78	1.17	2.08	0.68	1.76
	1.96	1.05	1.64	2.10	1.34	0.80

RUNOFF

TOTALS	0.857	0.582	1.015	1.852	1.433	1.709
	0.964	0.982	1.700	1.823	1.150	0.877
STD. DEVIATIONS	0.451	0.437	0.593	1.020	0.562	1.558
	1.148	0.793	1.064	1.553	1.284	0.710

EVAPOTRANSPIRATION

TOTALS	0.686	0.851	1.755	2.228	1.891	2.442
	1.576	1.306	1.178	1.360	0.961	0.765
STD. DEVIATIONS	0.143	0.222	0.502	0.878	0.379	0.899
	0.710	0.628	0.636	0.420	0.181	0.209

PERCOLATION FROM LAYER 2

TOTALS	0.4920	0.3219	0.4976	0.3851	0.3591	0.3181
	0.1844	0.2308	0.2233	0.4660	0.4906	0.5988
STD. DEVIATIONS	0.1429	0.1486	0.1848	0.1389	0.0502	0.0942
	0.1114	0.1028	0.1337	0.1793	0.1125	0.2408

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5

	(INCHES)		(CU. FT.)	PERCENT
PRECIPITATION	36.50	(4.500)	3404537.	100.00
RUNOFF	14.944	(2.207)	1393918.	40.94
EVAPOTRANSPIRATION	16.998	(2.367)	1585481.	46.57
PERCOLATION FROM LAYER 2	4.5675	(0.4240)	426033.	12.51
CHANGE IN WATER STORAGE	-0.010	(0.473)	-895.	-0.03

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 5

	(INCHES)	(CU. FT.) *
PRECIPITATION	2.09	194944.7
RUNOFF	1.699	158502.0
PERCOLATION FROM LAYER 2	0.0329	3066.0
HEAD ON LAYER 2	1.3	
SNOW WATER	1.49	138615.1

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.4730

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.0016

* Because Total Area of cover was adjusted, all numbers in this column should be multiplied by 1.2.

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FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	0.08	0.0760
2	3.38	0.4224
SNOW WATER	0.00	

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HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA, JULY 14, 1992
SINGLE CAP, ZONE A

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POOR GRASS

LAYER 1

VERTICAL PERCOLATION LAYER

THICKNESS	=	12.00 INCHES
POROSITY	=	0.3808 VOL/VOL
FIELD CAPACITY	=	0.1924 VOL/VOL
WILTING POINT	=	0.1043 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1924 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000046800000 CM/SEC

LAYER 2

BARRIER SOIL LINER

THICKNESS	=	24.00 INCHES
POROSITY	=	0.4224 VOL/VOL
FIELD CAPACITY	=	0.3495 VOL/VOL
WILTING POINT	=	0.2648 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4224 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000000850000 CM/SEC

LAYER 3

VERTICAL PERCOLATION LAYER

THICKNESS	=	48.00 INCHES
POROSITY	=	0.3394 VOL/VOL
FIELD CAPACITY	=	0.0906 VOL/VOL
WILTING POINT	=	0.0466 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0906 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000085000000 CM/SEC

LAYER 4

BARRIER SOIL LINER

THICKNESS	=	9.00 INCHES
POROSITY	=	0.4224 VOL/VOL
FIELD CAPACITY	=	0.3495 VOL/VOL
WILTING POINT	=	0.2648 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4224 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000000850000 CM/SEC

GENERAL SIMULATION DATA

SCS RUNOFF CURVE NUMBER	=	95.00 → 1345,224
TOTAL AREA OF COVER	=	~~1119300~~. SQ FT
EVAPORATIVE ZONE DEPTH	=	20.00 INCHES
UPPER LIMIT VEG. STORAGE	=	4.5696 INCHES
INITIAL VEG. STORAGE	=	3.3682 INCHES
INITIAL SNOW WATER CONTENT	=	0.0000 INCHES
INITIAL TOTAL WATER STORAGE IN SOIL AND WASTE LAYERS	=	20.5968 INCHES

SOIL WATER CONTENT INITIALIZED BY PROGRAM.

CLIMATOLOGICAL DATA

SYNTHETIC RAINFALL WITH SYNTHETIC DAILY TEMPERATURES AND
SOLAR RADIATION FOR INDIANAPOLIS INDIANA

MAXIMUM LEAF AREA INDEX = 2.00
START OF GROWING SEASON (JULIAN DATE) = 112
END OF GROWING SEASON (JULIAN DATE) = 264

NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
26.00	29.90	40.00	52.40	62.50	71.60
75.10	73.20	66.60	54.80	41.80	31.50

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.06	1.75	3.02	4.59	3.59	4.41
	2.83	2.46	3.14	3.65	2.71	2.29
STD. DEVIATIONS	0.72	0.78	1.17	2.08	0.68	1.76
	1.96	1.05	1.64	2.10	1.34	0.80
RUNOFF						
TOTALS	0.398	0.295	0.555	0.959	0.728	0.992
	0.468	0.640	1.059	0.979	0.537	0.489
STD. DEVIATIONS	0.302	0.204	0.390	0.585	0.376	0.799
	0.674	0.534	0.706	0.980	0.715	0.456
EVAPOTRANSPIRATION						
TOTALS	0.822	1.438	2.464	3.384	3.202	3.773
	2.371	1.909	1.835	2.089	1.364	0.904
STD. DEVIATIONS	0.246	0.249	0.340	0.908	0.702	0.752
	0.979	0.701	1.074	0.432	0.303	0.261

PERCOLATION FROM LAYER 2

TOTALS	0.7066	0.7165	0.4246	0.2227	0.1502	0.0000
	0.0000	0.0000	0.0000	0.0189	0.1210	0.5496
STD. DEVIATIONS	0.2680	0.2976	0.4044	0.3896	0.1630	0.0000
	0.0000	0.0000	0.0000	0.0422	0.2160	0.3601

PERCOLATION FROM LAYER 4

TOTALS	0.7215	0.7016	0.4740	0.2312	0.1598	0.0000
	0.0000	0.0000	0.0000	0.0170	0.1207	0.5087
STD. DEVIATIONS	0.2736	0.2612	0.3845	0.3764	0.1622	0.0000
	0.0000	0.0000	0.0000	0.0380	0.2201	0.3141

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5

	(INCHES)		(CU. FT.)*	PERCENT
PRECIPITATION	36.50	(4.500)	3404537.	100.00
RUNOFF	8.099	(1.922)	755430.	22.19
EVAPOTRANSPIRATION	25.557	(2.897)	2383794.	70.02
PERCOLATION FROM LAYER 2	2.9101	(0.7556)	271441.	7.97
PERCOLATION FROM LAYER 4	2.9344	(0.7819)	273704.	8.04
CHANGE IN WATER STORAGE	-0.090	(0.874)	-8391.	-0.25

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 5*

	(INCHES)	(CU. FT.)

PRECIPITATION	2.09	194944.7
RUNOFF	1.244	116044.9
PERCOLATION FROM LAYER 2	0.0383	3571.6
HEAD ON LAYER 2	7.8	
PERCOLATION FROM LAYER 4	0.0308	2873.3
HEAD ON LAYER 4	0.6	
SNOW WATER	1.49	138615.1

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.3462

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.1028

* Because total Area of cover was adjusted, all numbers in this column should be multiplied by .

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FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	3.03	0.2526
2	10.14	0.4224
3	4.36	0.0907
4	3.80	0.4224
SNOW WATER	0.00	

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HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA, JULY 14, 1992
SINGLE CAP, ZONE B

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POOR GRASS

LAYER 1

VERTICAL PERCOLATION LAYER

THICKNESS	=	12.00 INCHES
POROSITY	=	0.3808 VOL/VOL
FIELD CAPACITY	=	0.1924 VOL/VOL
WILTING POINT	=	0.1043 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1924 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000046800000 CM/SEC

LAYER 2

BARRIER SOIL LINER

THICKNESS	=	24.00 INCHES
POROSITY	=	0.4224 VOL/VOL
FIELD CAPACITY	=	0.3495 VOL/VOL
WILTING POINT	=	0.2648 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4224 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000000850000 CM/SEC

LAYER 3

VERTICAL PERCOLATION LAYER

THICKNESS	=	48.00 INCHES
POROSITY	=	0.3394 VOL/VOL
FIELD CAPACITY	=	0.0906 VOL/VOL
WILTING POINT	=	0.0466 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0906 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000085000000 CM/SEC

LAYER 4

BARRIER SOIL LINER

THICKNESS	=	48.00 INCHES
POROSITY	=	0.4224 VOL/VOL
FIELD CAPACITY	=	0.3495 VOL/VOL
WILTING POINT	=	0.2648 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4224 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000000850000 CM/SEC

GENERAL SIMULATION DATA

SCS RUNOFF CURVE NUMBER	=	95.00 733,125
TOTAL AREA OF COVER	=	~~610000~~. SQ FT
EVAPORATIVE ZONE DEPTH	=	20.00 INCHES
UPPER LIMIT VEG. STORAGE	=	4.5696 INCHES
INITIAL VEG. STORAGE	=	3.3680 INCHES
INITIAL SNOW WATER CONTENT	=	0.0000 INCHES
INITIAL TOTAL WATER STORAGE IN SOIL AND WASTE LAYERS	=	37.0704 INCHES

SOIL WATER CONTENT INITIALIZED BY PROGRAM.

CLIMATOLOGICAL DATA

SYNTHETIC RAINFALL WITH SYNTHETIC DAILY TEMPERATURES AND
SOLAR RADIATION FOR INDIANAPOLIS INDIANA

MAXIMUM LEAF AREA INDEX = 2.00
START OF GROWING SEASON (JULIAN DATE) = 112
END OF GROWING SEASON (JULIAN DATE) = 264

NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
26.00	29.90	40.00	52.40	62.50	71.60
75.10	73.20	66.60	54.80	41.80	31.50

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.06	1.75	3.02	4.59	3.59	4.41
	2.83	2.46	3.14	3.65	2.71	2.29
STD. DEVIATIONS	0.72	0.78	1.17	2.08	0.68	1.76
	1.96	1.05	1.64	2.10	1.34	0.80
RUNOFF						
TOTALS	0.398	0.295	0.555	0.959	0.728	0.992
	0.468	0.640	1.059	0.979	0.537	0.488
STD. DEVIATIONS	0.302	0.204	0.390	0.585	0.376	0.799
	0.674	0.534	0.706	0.980	0.715	0.456
EVAPOTRANSPIRATION						
TOTALS	0.822	1.438	2.464	3.384	3.202	3.773
	2.371	1.909	1.835	2.089	1.364	0.904
STD. DEVIATIONS	0.246	0.249	0.340	0.908	0.703	0.752
	0.979	0.701	1.074	0.432	0.303	0.261

PERCOLATION FROM LAYER 2						
TOTALS	0.7066	0.7165	0.4246	0.2228	0.1501	0.0000
	0.0000	0.0000	0.0000	0.0189	0.1209	0.5496
STD. DEVIATIONS	0.2679	0.2976	0.4043	0.3896	0.1628	0.0000
	0.0000	0.0000	0.0000	0.0422	0.2160	0.3601
PERCOLATION FROM LAYER 4						
TOTALS	0.7096	0.6989	0.4909	0.2315	0.1652	0.0000
	0.0000	0.0000	0.0000	0.0170	0.1206	0.5033
STD. DEVIATIONS	0.2618	0.2539	0.3923	0.3718	0.1626	0.0000
	0.0000	0.0000	0.0000	0.0380	0.2202	0.3077

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5

	(INCHES)		(CU. FT.)*	PERCENT
PRECIPITATION	36.50	(4.500)	1855417.	100.00
RUNOFF	8.099	(1.922)	411695.	22.19
EVAPOTRANSPIRATION	25.557	(2.898)	1299136.	70.02
PERCOLATION FROM LAYER 2	2.9100	(0.7551)	147923.	7.97
PERCOLATION FROM LAYER 4	2.9369	(0.7852)	149294.	8.05
CHANGE IN WATER STORAGE	-0.093	(0.877)	-4709.	-0.25

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 5

	(INCHES)	(CU. FT.)*

PRECIPITATION	2.09	106241.7
RUNOFF	1.244	63242.7
PERCOLATION FROM LAYER 2	0.0383	1946.4
HEAD ON LAYER 2	7.8	
PERCOLATION FROM LAYER 4	0.0294	1496.4
HEAD ON LAYER 4	0.9	
SNOW WATER	1.49	75542.9

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.3462

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.1028

* Because Total Area of cover was adjusted, all numbers in this column should by multiplied by 1.2.

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FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	3.03	0.2526
2	10.14	0.4224
3	4.36	0.0908
4	20.28	0.4224
SNOW WATER	0.00	

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HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA, JULY 14, 1992
COMPOSITE CAP, ZONE A

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POOR GRASS

LAYER 1

VERTICAL PERCOLATION LAYER

THICKNESS	=	12.00 INCHES
POROSITY	=	0.3808 VOL/VOL
FIELD CAPACITY	=	0.1924 VOL/VOL
WILTING POINT	=	0.1043 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1924 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000046800000 CM/SEC

LAYER 2

BARRIER SOIL LINER WITH FLEXIBLE MEMBRANE LINER

THICKNESS	=	24.00 INCHES
POROSITY	=	0.4300 VOL/VOL
FIELD CAPACITY	=	0.3663 VOL/VOL
WILTING POINT	=	0.2802 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4300 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000000100000 CM/SEC
LINER LEAKAGE FRACTION	=	0.00100000

LAYER 3

VERTICAL PERCOLATION LAYER

THICKNESS	=	48.00 INCHES
POROSITY	=	0.3394 VOL/VOL
FIELD CAPACITY	=	0.0906 VOL/VOL
WILTING POINT	=	0.0466 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0906 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000085000000 CM/SEC

LAYER 4

BARRIER SOIL LINER

THICKNESS	=	9.00 INCHES
POROSITY	=	0.4224 VOL/VOL
FIELD CAPACITY	=	0.3495 VOL/VOL
WILTING POINT	=	0.2648 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4224 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000000850000 CM/SEC

GENERAL SIMULATION DATA

SCS RUNOFF CURVE NUMBER	=	95.00
TOTAL AREA OF COVER	=	~~1119300~~ 1,345,224. SQ FT
EVAPORATIVE ZONE DEPTH	=	20.00 INCHES
UPPER LIMIT VEG. STORAGE	=	4.5696 INCHES
INITIAL VEG. STORAGE	=	4.1823 INCHES
INITIAL SNOW WATER CONTENT	=	0.0000 INCHES
INITIAL TOTAL WATER STORAGE IN SOIL AND WASTE LAYERS	=	20.7792 INCHES

SOIL WATER CONTENT INITIALIZED BY PROGRAM.

CLIMATOLOGICAL DATA

SYNTHETIC RAINFALL WITH SYNTHETIC DAILY TEMPERATURES AND
SOLAR RADIATION FOR INDIANAPOLIS INDIANA

MAXIMUM LEAF AREA INDEX = 2.00
START OF GROWING SEASON (JULIAN DATE) = 112
END OF GROWING SEASON (JULIAN DATE) = 264

NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
26.00	29.90	40.00	52.40	62.50	71.60
75.10	73.20	66.60	54.80	41.80	31.50

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.06	1.75	3.02	4.59	3.59	4.41
	2.83	2.46	3.14	3.65	2.71	2.29
STD. DEVIATIONS	0.72	0.78	1.17	2.08	0.68	1.76
	1.96	1.05	1.64	2.10	1.34	0.80
RUNOFF						
TOTALS	0.900	0.661	1.100	1.393	0.993	1.077
	0.466	0.640	1.051	0.979	0.540	0.532
STD. DEVIATIONS	0.690	0.357	0.741	0.870	0.475	0.812
	0.671	0.534	0.690	0.981	0.713	0.479
EVAPOTRANSPIRATION						
TOTALS	0.819	1.433	2.397	3.141	3.063	4.922
	2.487	1.881	1.864	2.085	1.357	0.895
STD. DEVIATIONS	0.244	0.248	0.363	0.984	0.680	0.662

	0.997	0.770	1.098	0.406	0.305	0.257

PERCOLATION FROM LAYER 2

TOTALS	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000

PERCOLATION FROM LAYER 4

TOTALS	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5

	(INCHES)		(CU. FT.)	PERCENT
PRECIPITATION	36.50	(4.500)	3404537.	100.00
RUNOFF	10.332	(2.830)	963737.	28.31
EVAPOTRANSPIRATION	26.344	(2.798)	2457247.	72.18
PERCOLATION FROM LAYER 2	0.0009	(0.0001)	87.	0.00
PERCOLATION FROM LAYER 4	0.0009	(0.0001)	87.	0.00
CHANGE IN WATER STORAGE	-0.177	(1.107)	-16534.	-0.49

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 5

	(INCHES)	(CU. FT.)

PRECIPITATION	2.09	194944.7
RUNOFF	1.170	109103.8
PERCOLATION FROM LAYER 2	0.0000	0.5
HEAD ON LAYER 2	12.0	
PERCOLATION FROM LAYER 4	0.0000	0.5
HEAD ON LAYER 4	0.0	
SNOW WATER	1.49	138615.1

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.3808

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.1028

* Because Total Area of Cover was adjusted, all numbers in this column should be multiplied by 1.2.

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FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	3.30	0.2747
2	10.32	0.4300
3	4.35	0.0906
4	3.80	0.4224
SNOW WATER	0.00	

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APPENDIX A5

Rate of Landfill Gas Generation

TECHNICAL MEMORANDUM A5

DATE: August 4, 1992

TO: Mehdi Geraminegad

FROM: Karen Roberts

SUBJECT: EPA Region V ARCS Contract No. 68-W8-0093
EPA Work Assignment No. 17-5L4J
SEC Donohue Project No. 20026
Himco Dump FS

Rate of Landfill Gas Generation

An estimate of the landfill gas generation rate was made for the Himco site for the purpose of conceptual design and costing an active gas collection system at the Himco site. This memorandum summarizes the calculations and assumptions for this estimation. The rate of gas generation was calculated by first estimating the volume and weight of the waste mass in the landfill and then, using a relationship for the rate of gas generation per unit weight of the waste mass, the gas generation rate in the landfill was estimated.

The volume of in-place refuse in the landfill was estimated by multiplying the area of the landfill by the average thickness of waste in the landfill. The average waste thickness was estimated using the site topographic map and groundwater contour map, assuming groundwater constitutes the bottom of the landfill, prepared as a part of the RI for the Himco site. The refuse thickness was calculated to be 13 feet thick. The surface area of the landfill area is 2,078,350 square feet. The volume of total in-place waste in the landfill was estimated to be 27,018,550 cubic feet.

Additionally, it was assumed that two-thirds of the waste in the Himco site landfill is calcium sulfate (RI Report, 1992). Because calcium sulfate does not produce gas because it will not degrade, the remaining one-third waste mass was counted as the gas producing waste in the landfill.

The equation used to calculate the volume of gas producing waste is as follows:

Volume of gas producing waste = (average depth to water table) x (surface area) x (1/3)

Volume of gas producing waste = (13 ft) x (2,078,350 ft^2) x (1/3) = 9,006,180 ft^3 = 333,600 cubic yards

The following equation estimates the methane generation rate per year for the Himco site assuming 1 cubic yard = 1 ton:

Generation rate = 0.334 million tons x 972 tons/year/million tons = 324.6 tons/yr

The methane generation rate per unit waste volume was estimated using the method used by the California Air Resources Board published in Hazardous Materials Control (HMC), July/August 1991 titled "Landfill Gas Health Risk Assessment." According to this source, methane is produced at a rate of 972 tons per year per million tons of in-place refuse. Using this production rate, the emission rate at the Himco site was estimated at 7.26×10^6 SCF/year.

In order to verify this estimation, another source was used. According to Wilkey, et al., 1982, the total production of landfill gas from typical municipal refuse varies from less than 1 scf/lb to 7 scf/lb and typically contains approximately 50% methane. Comparing the production rates from Wilkey (attached calculation) with the estimated landfill gas generation using the HMC's rate indicates that; the HMC's rate is within, but on the low end of the Wilkey's rates. As such this rate may be used for design or cost evaluation relative to the gas collection system.

Attachment

A/R/HIMCO/AT1

ESTIMATED HMC LFG GENERATION:

$$325 \frac{\text{TONS}}{\text{YRS}} \times \frac{2000\ \#}{\text{TON}} \times \frac{ft^3}{0.895\ \#} = 7.26 * 10^6\ \text{SCF/YR}$$

MAXIMUM PROJECTED LFG GENERATION:

$$7 \frac{\text{SCF}}{\#} \times \frac{2000\ \#}{\text{TON}} \times 334{,}000\ \text{TONS} = 4.68 * 10^9\ \text{SCF}$$

$$\frac{4.68 * 10^9\ \text{SCF}}{70\ \text{YRS}} = 66.8 * 10^6 \frac{\text{SCF}}{\text{YR.}}$$

$$100\ \text{YRS} = 46.8 * 10^6 \frac{\text{SCF}}{\text{YR}}$$

MINIMUM PROJECTED LFG GENERATION:

$$1 \frac{\text{SCF}}{\#} \times 2000 \# \times 334{,}000\ \text{TONS} = 0.67 * 10^9\ \text{SCF}$$

$$\frac{0.67 * 10^9\ \text{SCF}}{70} = 9.54 * 10^6 \frac{\text{SCF}}{\text{YR}}$$

$$100 = 6.68 * 10^6 \frac{\text{SCF}}{\text{YR.}}$$

CALCULATE DENSITY OF LANDFILL GAS.

50% - CO_2

50% - CH_4

$PV = NRT$

$PV = \left(\frac{WT}{MW}\right) RT$

$\rho = \frac{WT}{V} = \frac{P \cdot MW}{RT}$

$\rho = \frac{P \cdot MW}{RT}$

ASSUME: STANDARD TEMPERATURE AND PRESSURE

1 ATMOSPHERE PRESSURE = 14.7 psia.

459 °R.

ASSUME: 50% METHANE (CH_4) 50% (CO_2) LANDFILL GAS MIX

MW CH_4 (H) $4 \times 1 = 4$

(C) $1 \times 12 = 12$

16 lb/lbmole $\times .5 = 8$ lb/lbmol

MW CO_2 (O) $2 \times 16 = 32$

(C) $1 \times 12 = 12$

44 lb/lbmole $\times .5 = 22$ lb/lbmol

AVG. MW → 30 lb/lbmole.

$\rho = \frac{1 \text{ ATM} \cdot 30 \text{ lb/lbmole}}{.73 \frac{\text{FT}^3 \cdot \text{ATM}}{\text{°R lbmole}} \times 459 \text{ °R}} = .0895 \frac{\text{lb}}{\text{FT}^3}$

APPENDIX A6

Cap Construction

TECHNICAL MEMORANDUM A6

DATE: June 29, 1992

TO: Mehdi Geraminegad

FROM: Karen Roberts

SUBJECT: EPA Region V ARCS Contract No. 68-W8-0093
EPA Work Assignment No. 17-5L4J
SEC Donohue Project No. 20026
Himco Dump FS
Cap Construction

INTRODUCTION

The purpose of this memorandum is to summarize the calculations used to estimate the areal extent of the cap and the volume of a buffer layer required to create a 4% slope over the capped areas. This memorandum will then provide an explanation for the proposed capping alternatives which include both single and composite barrier cap.

EXTENT OF THE CAP AREA

The cap will be designed to cover the landfill and the contaminated surface soil in the construction debris area and in an area immediately south of the landfill. The areal extent of the landfill was defined based on the geophysical survey, trenching and soil boring results from the Remedial Investigation (RI). The extent of the contaminated surface soil area was defined based on the extent of semi-VOC contaminated surface soil in the area immediately south of the landfill within the site boundary. The extent of the landfill, the construction debris area, and the contaminated surface soil to be capped are shown on attached Figure 1.

After the cap boundary was determined, the area of the cap was calculated using a planimeter. The area of the cap, including both landfill and the contaminated surface soil areas was calculated to be 2,522,567 square feet or 58 acres. The landfill area was calculated to be 2,078,350 square feet and the contaminated surface soil area accounts for the remaining area. The whole site area was estimated to be 4,436,668 ft_2 or 102 acres.

CAP DESIGN

In order to provide a capping construction design for the Himco Dump Landfill, both State of Indiana requirements and the Federal Subtitle D landfill regulations were reviewed. A combination of both regulations plus additional components were included in the design.

Closure requirements for a Subtitle D landfill (Federal Register Vol. 56, No. 196) require an infiltration layer (clay layer) which must be a minimum 18-inch thick earthen material with a permeability of no greater than $1x10^{-5}$ cm/sec. An erosion layer of no less than 6 inches thick must be placed on top of the infiltration layer.

Current regulations for the State of Indiana (1991 Supplement of the Indiana Administrative Code, Volume 3, Title 329, Article 2, Rule 14, Section 19, titled "Final Cover of Solid Waste Land Disposal Facility Requirements" current regulations for the State of Indiana) require an infiltration layer (clay layer) a minimum of two feet thick for less than 15% surface slope and an erosion layer of at least six inches thick. The Indiana Administrative Code also states that the final cover shall have a minimum 4% slope.

The current surface topography on the Himco Dump site is relatively flat. In order to obtain the required 4% slope for proper drainage, a buffer layer needs be added to the surface of the cap area. In order to minimize the amount of buffer material needed for capping, the cap in two areas (landfill and contaminated surface soil area) will be constructed independently with area-specific drainage patterns.

The volume of the buffer layer in the landfill area was determined by preparing three cross-sections of the landfill surface and superposing the 4% slope, such that it leads to the formation of two valleys (see attached Figures 2 and 3). The drainage water will be tapped from the valleys by means of a perforated 4-inch PVC or HDPE drainage tile extended along the entire length of both valleys. The area between the 4% slope and the existing landfill cover was estimated for each cross-section. The total soil volume was calculated by multiplying each area by half the distance between the cross-sections as follows:

Total Soil Volume = $(Area_1 * Distance_1) + (Area_2 * Distance_2) + (Area_3 * Distance_3)$

= (2,145 sq ft * 670 ft) + (2461 sq ft * 700 ft) + (1,925 sq ft * 680 ft)

= 4,468,990 cu ft.

Average Thickness of the Buffer Layer = Volume/Area

(4,468,990 cu. ft.)/(2,078,350 sq. ft.)

= 2.15 ft.

Since the contaminated surface soil area is not included within the landfill boundary, Subtitle D regulations do not apply. However, to maintain consistency, this area will be capped with the same design as the landfill area. The only exception is that no buffer layer will be included in the cap construction for this area.

The cap construction for the single barrier solid waste cap will consist of four layers: a buffer layer (landfill area only), clay layer, drainage layer, and top soil or erosion layer. The thickness of these layers complies with the current IDEM Subtitle D standards and the federal Subtitle D regulations. The thickness of the buffer layer over the landfill area averages 2.15 feet to build a 4% slope on the site. The clay layer thickness required by IDEM for a 4% surface slope is a minimum of 2 feet. The drainage and erosion layers combined will be 24 inches thick. The drainage layer was added to the cap design to prevent erosion better than the 6-inch required layer.

The composite barrier cap is similar to the single barrier cap except that a synthetic liner is added to the design. A 40 mil HDPE geosynthetic liner will work in combination to further protect against infiltration.

There are two monitoring well nests existing in the proposed capping area. These include well nest WT-101A, P-101B, and P-101C and well nest W-M-1 and W-M-2. The locations of these well nests are shown on the attached figure titled "Approximate Landfill Boundary." Both well nests will be covered by the cap but are near the edge of the capped area. The cap will be a minimum of 3 feet thick in areas with no buffer material. Due to the close proximity of the well nests to the cap edge, a manhole or flush mount system may be a practical way to preserve these well nests and avoid abandoning then during cap construction. Further evaluation of these well nests should be made as a part of the design of the cap. If the well nests are abandoned, they should be replaced with new wells to aide in monitoring the groundwater.

A/R/HIMCO/AT2

EXTENT OF LANDFILL CAP

CROSS SECTION 1

CROSS SECTION 2

CROSS SECTION 3

EXTENT OF CONSTRUCTION DEBRIS AREA

EXTENT OF CONTAMINATED SURFACE SOIL CAP

— EXTENT OF LANDFILL

-- EXTENT OF THE CONTAMINATED SURFACE SOIL TO BE CAPPED

-•- EXTENT OF THE CONSTRUCTION DEBRIS AREA

0 100 200 400

Revisions	By	Date

Scale	AS SHOWN
Date	JAN. 1992
Designer	SP
Drafter	EZ
Checker	
Approver	
No.	

DONOHUE ENGINEERS ARCHITECTS SCIENTISTS

FIGURE 1
AREA TO BE CAPPED
HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA

Sheet No.
Off. Loc. File No.
Project PHASE 2
Drawing No. 20026

Jan. 30, 1992 10:34:48) SURFSED.H2C

Figure 2, Locations for Cross sections

SITE TOPOGRAPHIC MAP
HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA

Donohue ENGINEERS ARCHITECTS SCIENTISTS

Drawing No.	
Project No. 20026	
Sheet No.	
CHICAGO OFF. LOC.	PHASE 2 FILE NO.

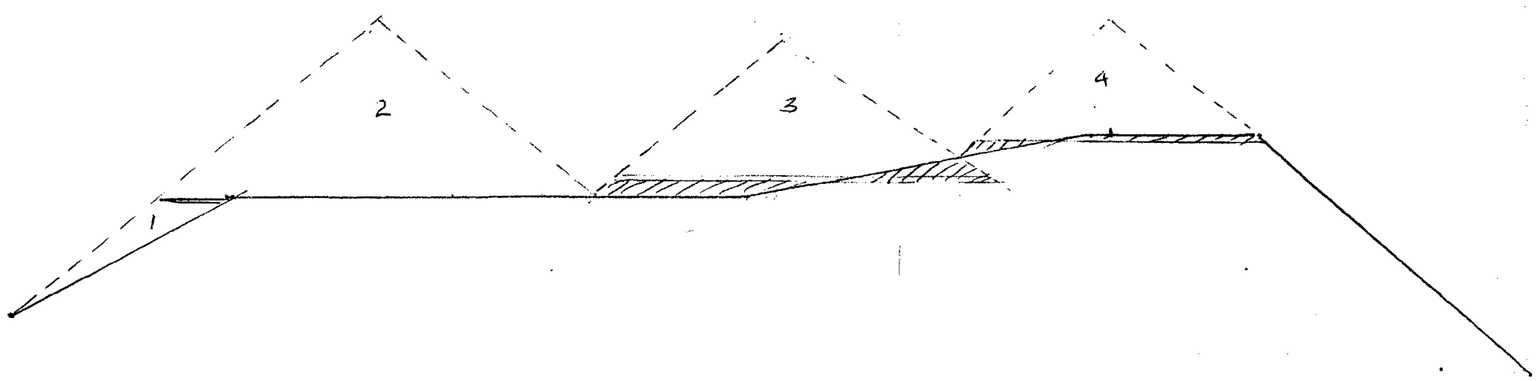
Scale	AS SHOWN				
Date	JAN. 1992				
Designer	SP				
Drafter	EZ				
Checker					
Approver		No.	Revisions	By	Date

Donohue
Engineers & Architects

CLIENT EPA PROJECT NO. 20033.003 BY Zafar Ahmed
PROJECT Himco Dump DATE 7/30/92 PAGE NO.

CROSS SECTION 1

SCALE
X-AXIS →



CALCULATIONS

AREA OF CROSS SECTION 1 = $\frac{1}{2} \times 50 \times 4 + \frac{1}{2} \times 300 \times 6$
$+ \frac{1}{2} \times 250 \times 5 + \frac{1}{2} \times 210 \times 4$
$= 2145 \text{ Ft}^2$.

Figure 3, Cross Section 1

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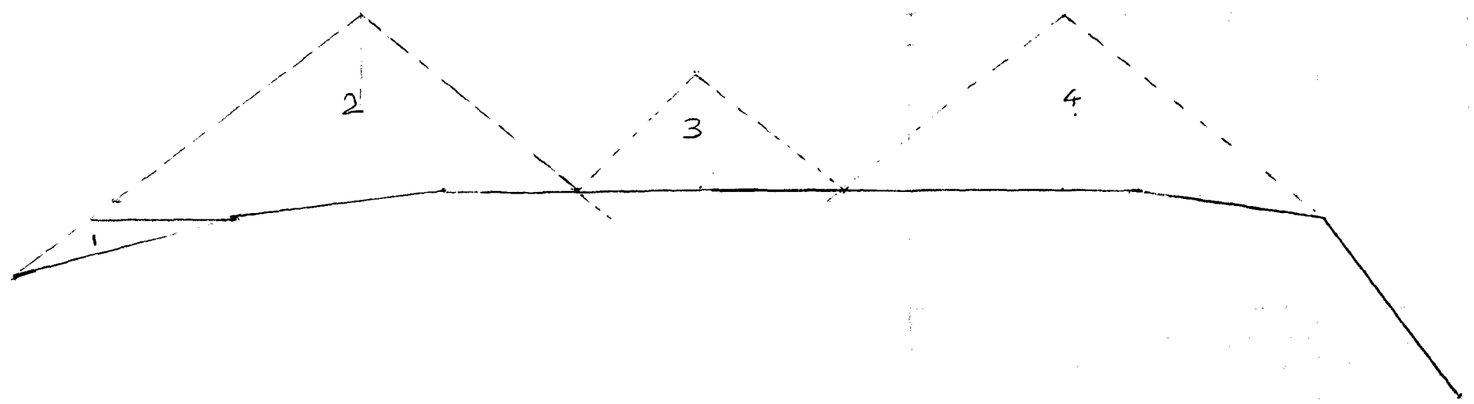
CLIENT EPA PROJECT NO. BY Zafar Ahmed
PROJECT Himco DATE 07/30/92 PAGE NO.

CROSS SECTION 2

(refer to site topographic Map)

SCALE ←100'→
X-AXIS → |||||



CALCULATIONS

AREA OF CROSS SECTION 2 $= \frac{1}{2} \times 100 \times 2.0 + \frac{1}{2} \times 320 \times 6.25$

$+ \frac{1}{2} \times 135 \times 4.0 + \frac{1}{2} \times 310 \times 6.25$

$= 2460 \text{ Ft}^2$.

Figure 3, Cross section 2

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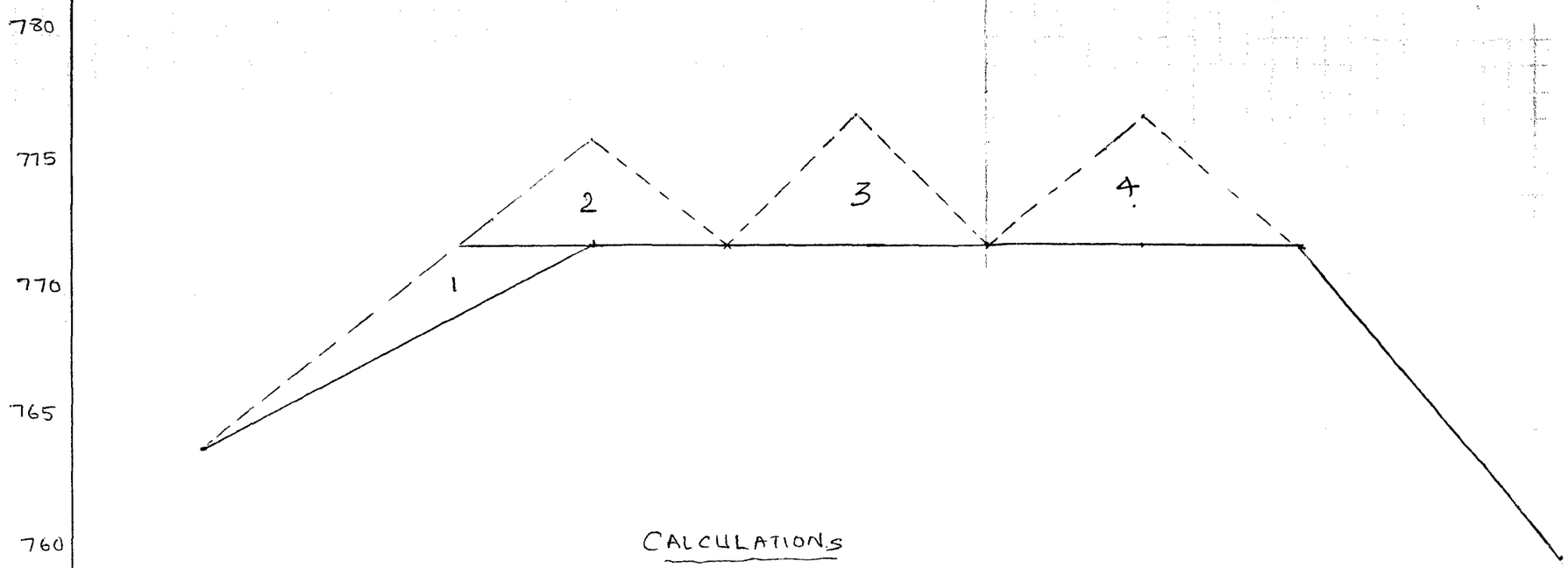
CLIENT EPA PROJECT NO. _____ BY Zafar Ahmed
PROJECT Himco DATE 01/30/92 PAGE NO. _____

CROSS SECTION 3 :
(Refer site Topographic Map)

SCALE
X-AXIS → ← 100' →



CALCULATIONS

AREA OF CROSS SECTION 3 = $\frac{1}{2} \times 100 \times 8.0 + \frac{1}{2} \times 200 \times 4$

$+ \frac{1}{2} \times 200 \times 5 + \frac{1}{2} \times 250 \times 5$

$= 1925 \text{ Ft}^2$

Figure 3, Cross Section 3

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Engineers & Architects

CLIENT EPA PROJECT NO. 20026 BY Zafer Ahmed
PROJECT Himco DATE 07/30/92 PAGE NO.

CALCULATIONS

TOTAL VOLUME (Refer to site Topographic Map) = AREA OF CROSS SECTION 1 x DISTANCE.
+ AREA OF CROSS SECTION 2 x DISTANCE
+ AREA OF CROSS SECTION 3 x DISTANCE

= 2145 x 670 + 2461 x 700 + 1925 x 680

= 4, 468, 990. Ft^3

AVERAGE THICKNESS OF THE BUFFER LAYER = $\frac{\text{VOLUME}}{\text{AREA}}$

= $\frac{4,468,990\ Ft^3}{2,078,350\ Ft^2}$

= 2.15 Ft.

APPENDIX A7

Proposed Preliminary Groundwater Monitoring Program

TECHNICAL MEMORANDUM A7

DATE: August 3, 1992

TO: Mehdi Geraminegad

FROM: Karen Roberts

SUBJECT: EPA Region V ARCS Contract No. 68-W8-0093
EPA Work Assignment No. 17-5L4J
SEC Donohue Project No. 20026
Himco Dump FS

Proposed Preliminary Groundwater Monitoring Program

Groundwater monitoring has been incorporated in all alternatives, except the "No Action Alternative", to determine whether the remedy is effective in meeting the remedial action objectives. This preliminary groundwater monitoring program has been proposed for the purpose of cost-estimating for this FS. The actual monitoring program will be prepared as a part of the predesign/design study. This memorandum summarizes the scope of the preliminary groundwater monitoring program proposed for the Himco site.

The groundwater monitoring program consists of installation of new monitoring wells and two rounds per year of groundwater sampling. According to this program, existing background wells WT102A, P102B, WTB1, and WTB2 and downgradient wells WT104, WT111A, WTM1, WT101A, P101B, WTE1, WTE2, and WT105A will be sampled bi-annually. In addition, seven new monitoring wells (MW01S, MW01D, MW02, MW03S, MW03D, MW04, and MW05) will be installed and sampled biannually. In the new monitoring wells, the subscripts "S" and "D" denote shallow well and deep well respectively. These monitoring wells will be installed to minimize distance between sampling points and thus reducing the potential for missing plumes emanating from the site. The proposed locations for the new monitoring wells are shown in the attached figure. Shallow wells will be installed at approximately 30 feet and deep wells will be at approximately 70 feet.

Three wells W-M-1, WT-101A, and P-101B are presently located in an area of the landfill that is proposed to be covered by a landfill cap. Abandonment of these wells will be determined in the design phase of a landfill cap if that alternative is chosen. Any wells that are abandoned should be redrilled and installed in a new location.

The groundwater monitoring program will include all 19 wells mentioned above. These 19 wells will be sampled and analyzed for TAL and TCL full scan twice yearly.

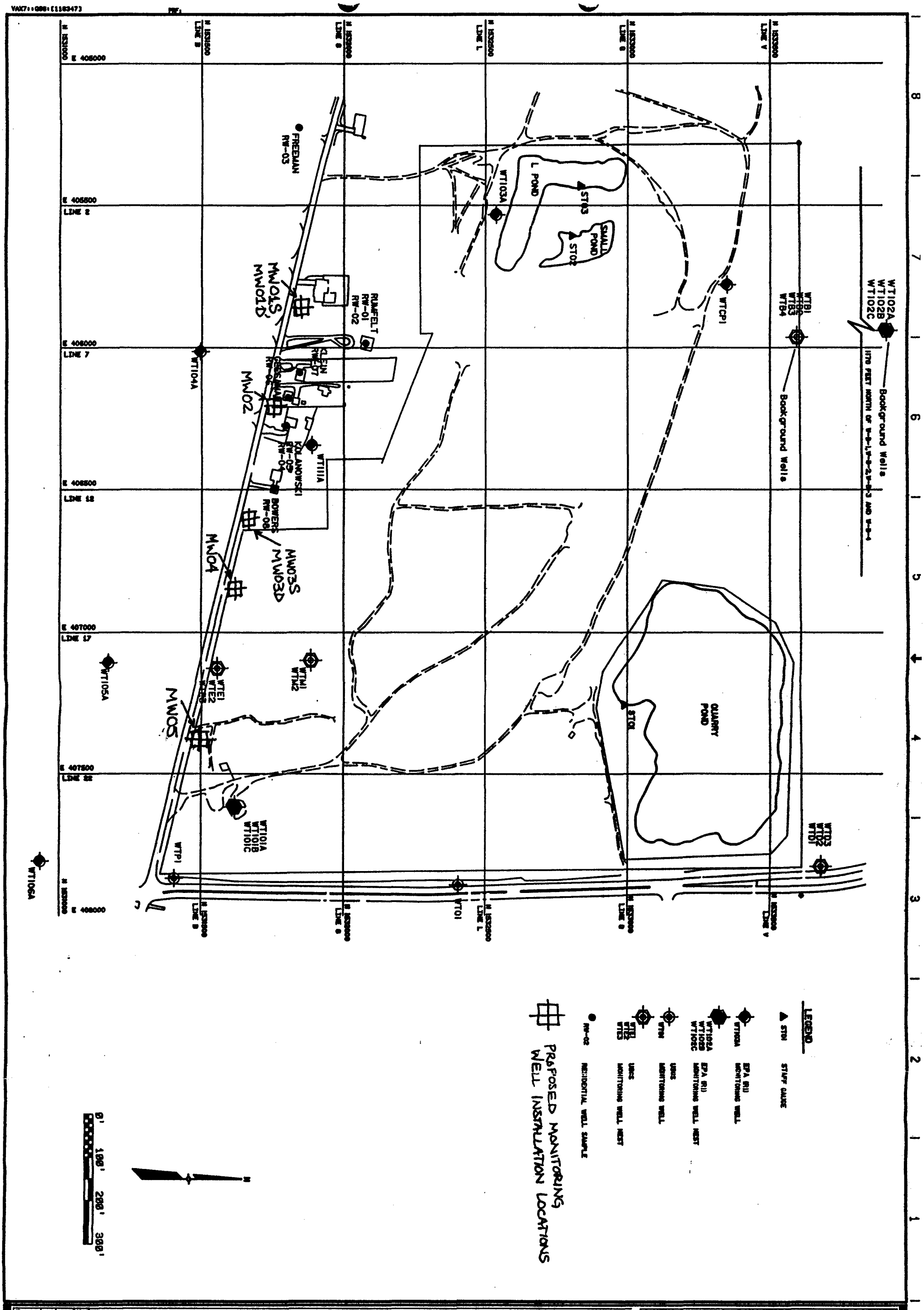


FIGURE 2-3

GROUNDWATER MONITORING WELL LOCATIONS

HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA

Donohue ENGINEERS ARCHITECTS SCIENTISTS

Scale	AS SHOWN				
Date	NOV. 1991				
Designer	SP				
Drafter	EZ				
Checker					
Approver		No.	Revisions	By	Date

Drawing No. 2-3
Sht. No.
Sht. Tot.
File No.

APPENDIX A8

Proposed Levels of Contaminants of Concern Which Would Trigger a Groundwater Study at the Himco Site

TECHNICAL MEMORANDUM A8

DATE: August 7, 1992

TO: Himco Files

FROM: Lois Kimmelman
Kathleen Flaherty

SUBJECT: Proposed Levels of Contaminants of Concern Which Would Trigger a Groundwater Study at the Himco Dump Superfund Site

INTRODUCTION

According to the Himco Dump Superfund Site RI, the groundwater outside the landfill boundaries has not been impacted to a level of health and environmental concern by the site contaminants, and, therefore, cleanup goals as such have not been developed for groundwater in this FS. However, because there are potentials for releases of the contaminated leachate into the aquifer, the FS alternatives include a groundwater monitoring program to evaluate whether the remedy is effective in meeting the remedial action objectives. This technical memorandum provides levels which would trigger a groundwater study. Groundwater contamination beyond these levels is an indication that the remedy is possibly ineffective in meeting the remedial action objectives. Under these conditions, a groundwater study is warranted to further evaluate the site condition and to identify the potential remedy if required for the site. The cleanup standards set in this technical memorandum were prepared using the existing data and should be revised as new data is obtained.

Several criteria were evaluated for their suitability to serve as levels of contamination which would trigger a groundwater study at this site. First, risk-based criteria were evaluated to determine whether the CERCLA requirement of a risk of 1.00E-04 can be achieved for carcinogens at this site (a risk level of 1.00E-04 represents CERCLA's minimum level to trigger an action; however, once an action has started, 1.00E-06 will be the target clean up level). This risk-based evaluation indicated that such a carcinogenic risk level cannot be achieved, primarily due to the fact that at their maximum contaminant levels (MCLs) or contract required quantitation limits (CRQLs), some of the carcinogens detected in site groundwater contribute a carcinogenic risk estimate greater than 1.00E-04 (see Tables 1 through 3). Based on this evaluation, no risk-based cleanup levels are presented in this technical memorandum.

As a second alternative, a comparison was made between the MCL (if available), and 95% upper confidence limit (UCL) based on background well data (see Tables 4a, 5a, and 6b), for each site contaminant of concern. Tables 4, 5, and 6 present the criteria levels for the contaminants of concern, with Table 4 including inorganic chemicals (metals and cyanide), Table 5 including volatile organic compounds, and Table 6 semi-volatile organic compounds. The highest of the two criteria levels for each contaminant is chosen and proposed as the level which would trigger a groundwater study at this site (see last column of Tables 4, 5, and 6).

These tables also include the CRQLs for the contaminants of concern for comparison with the other cleanup criteria.

The 95% UCL defines the upper limit of the concentration range from background well data, within which a large proportion of the monitoring observations should fall with high probability. Thus, if any observation from a compliance well exceeds the 95% UCL, that is statistically significant evidence that the well is contaminated.

The 95% UCL was calculated as follows:

$$95\%\ UCL = \bar{X} + KS$$

where $\bar{X}$ is the mean of background well sample results for the particular chemical, K is the one-sided normal tolerance factor, and S is the standard deviation from the background well data. (This formula is stated on page 5-22 of EPA's Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Final Guidance, Office of Solid Waste, April 1989. K values are from Table 5, Appendix B of this document.)

The $\bar{X}$ value was calculated by adding together each background sample result and dividing the sum by the number of background samples. If the chemical was not detected, half of the quantitation limit was used as the sample result.

No 95% UCL was calculated for those chemicals not detected at least once in any background well sample.

CONCLUSION

As shown in Tables 4, 5, and 6, MCL criteria, where they are available, will be the primary criteria selected as the proposed trigger levels. The only contaminants whose trigger levels are based on the 95% UCL are antimony, lead, vanadium, and methylene chloride.

TABLE 1

HIMCO DUMP SUPERFUND SITE

PROPOSED LEVELS TO TRIGGER A GROUNDWATER STUDY FOR CARCINOGENS GROUNDWATER (MG/ L)

Chemicals	Current Concentration (a)	Current Risk	ARARs MCL	Risk @ MCL	Contract Required Quantitation Limit	Risk @ CRQL
Vinyl Chloride	2.80 E-02	8.00 E-04	2.00 E-03	5.00 E-05	1.00 E-02	3.00 E-04
Benzo (a) pyrene	4.00 E-03	5.00 E-04	2.00 E-04	3.00 E-05	1.00 E-02	1.00 E-03
Benzo (b) fluoranthene	5.60 E-03	7.00 E-04	–	–	1.00 E-02	1.00 E-03
Benzo (k) fluoranthene	2.00 E-03	3.00 E-04	–	–	1.00 E-02	1.00 E-03
Chrysene	4.00 E-03	5.00 E-04	–	–	1.00 E-02	1.00 E-03
Indeno (1,2,3-cd) pyrene	2.00 E-03	3.00 E-04	–	–	1.00 E-02	1.00 E-03
Arsenic	1.70 E-02	3.00 E-04	5.00 E-02	1.00 E-03	1.00 E-02	2.00 E-04
Beryllium (b)	2.60 E+00	1.00 E-01	4.00 E-03	4.00 E-04	5.00 E-03	4.00 E-04
TOTAL:		1.03 E-01		1.48 E-03		5.90 E-03

(a) Exposure Point Concentrations (EPC) used in baseline risk assessment, groundwater beneath landfill, except for nitrate/ nitrite. Value for nitrate/ nitrite is EPC for deep groundwater.

(b) Beryllium not detected in leachate samples or in groundwater samples below landfill. Current concentration is 95% Upper Confidence Limit (UCL) on arthrimetic mean of sample results evaluated ar one-half detection limit.

TABLE 2

HIMCO DUMP SUPERFUND SITE

PROPOSED LEVELS TO TRIGGER A GROUNDWATER STUDY FOR NONCARCINOGENS – SUBCHRONIC GROUNDWATER (MG/ L)

Chemicals	Current Concentration (a)	Current Risk	ARARs MCL	Risk @ MCL	Contract Required Quantitation Limit	Risk @ CRQL
Carbon disulfide	5.70 E– 02	3.00 E+ 00	–	–	1.00 E-02	4.00 E-01
alpha–Chlordane	2.20 E– 04	4.00 E+ 00	2.00 E-03	3.20 E+01	5.00 E-05	8.00 E-01
Antimony	5.20 E+ 00	8.00 E+ 02	6.00 E-03	4.00 E-01	6.00 E-02	1.00 E+01
Arsenic	1.70 E– 02	4.00 E+ 00	5.00 E-02	5.00 E+00	1.00 E-02	2.00 E+00
Nitrate/ Nitrite	4.80 E– 01	3.00 E– 01	1.00 E+01	3.00 E+00	1.00 E-01	6.00 E-02
Beryllium (b)	2.60 E+ 00	9.00 E+ 01	4.00 E-03	1 E-01	5.00 E-03	1.00 E-01
Chromium	2.90 E+ 00	9.00 E+ 00	1.00 E-01	3.00 E-01	1.00 E-02	3.00 E-02
Vanadium	2.50 E+ 00	2.00 E+ 01	–	–	5.00 E-02	5.00 E-01
TOTAL:		9.30 E+ 02		4.08 E+01		1.39 E+01

(a) Exposure Point Concentrations (EPC) used in baseline risk assessment, groundwater beneath landfill, except for nitrate/ nitrite. Value for nitrate/ nitrite is EPC for deep groundwater.

(b) Beryllium not detected in leachate samples or in groundwater samples below landfill. Current concentration is 95% Upper Confidence Limit (UCL) of sample results evaluated at one–half detection limit.

TABLE 3

HIMCO DUMP SUPERFUND SITE

PROPOSED LEVELS TO TRIGGER A GROUNDWATER STUDY FOR NONCARCINOGENS – CHRONIC GROUNDWATER (MG/ L)

Chemicals	Current Concentration (a)	Current Risk	ARARs MCL	Risk @ MCL	Contract Required Quantitation Limit	Risk @ CRQL
Arsenic	1.70 E– 02	1.00 E+ 00	5.00 E–02	5.00 E+00	1.00 E–02	9.00 E–01
Antimony	5.20 E– 04	4.00 E+ 02	6.00 E–03	1.00 E+00	6.00 E–02	4.00 E+00
Nitrate/ Nitrite	4.80 E– 01	1.00 E– 01	1.00 E+01	2.00 E+00	1.00 E–01	2.00 E–02
Beryllium	2.60 E+ 00	2.00 E+ 01	4.00 E–03	4.00 E–02	5.00 E–03	5.00 E–02
Cadmium	1.10 E+ 00	6.00 E+ 01	5.00 E–03	3.00 E–01	5.00 E–03	5.00 E–02
Chromium	2.90 E+ 00	2.00 E+ 01	1.00 E–01	5.00 E–01	1.00 E–02	3.00 E–01
TOTAL:		5.01 E+ 02		8.84 E+00		5.32 E+00

(a) Exposure Point Concentrations (EPC) used in baseline risk assessment, groundwater beneath landfill, except for nitrate/ nitrite. Value for nitrate/ nitrite is EPC for deep groundwater.

(b) Beryllium not detected in leachate samples or in groundwater samples below landfill. Current concentration is 95% Upper Confidence Limit (UCL) of sample results evaluated ar one–half detection limit.

TABLE 4

HIMCO DUMP SUPERFUND SITE

PROPOSED LEVELS TO TRIGGER A GROUNDWATER STUDY FOR INORGANIC CHEMICALS

Contaminant	CRQL (ug/L)	ARARs MCL (ug/L)	95% UCL (TL) * X + KS (ug/L)	Proposed Level to Trigger Active Remediation (1) (ug/L)
Antimony	32.00	6.0	52.734	53.00
Antimony (dis)	32.00	6.0	63.035	63.00
Arsenic	5.00	50.0	7.126	50.00
Arsenic (dis)	5.00	50.0	1.743	50.00
Barium	200.00	1000	147.987	1000.00
Barium (dis)	200.00	1000	125.457	1000.00
Beryllium	0.03	4.0	3.598	4.00
Beryllium (dis)	0.03	4.0	–	4.00
Cadmium	4.00	10.0	–	10.00
Cadmium (dis)	4.00	10.0	–	10.00
Chromium	7.00	50.0	27.954	50.00
Chromium (dis)	7.00	50.0	–	50.00
Lead	5.00	15.0	94.054	94.00
Lead (dis)	5.00	15.0	28.313	28.00
Mercury	0.20	2.0	–	2.00
Mercury (dis)	0.20	2.0	–	2.00
Vanadium	8.00	n/a	26.815	27.00
Vanadium (dis)	8.00	n/a	13.443	13.00
Cyanide	10.00	200.0	–	200.00
Nitrogen, Nitrate + Nitrite	0.02 – 40.1	10,000.0	19.801	10000.00

(dis) Dissolved

(1) Proposed level is the highest value taken from the CRQLs, MCLs, and 95% UCLs, columns.

n/a information not available

* For 95% UCL (TL) values not listed in the table, the calculations were not completed because the contaminant was not detected at any background wells.

CRQL – Contract Required Quantitation Limit

ARARs – Applicable or Relevant and Appropriate Requirements

MCL – Maximum Contaminant Level

UCL – Upper Confidence Limit

TL – Tolerance Level

TABLE 4A

HIMCO DUMP SUPERFUND SITE

CONCENTRATIONS OF INORGANIC CHEMICALS IN BACKGROUND WELLS

Contaminant / Well # / Month (period)	WTB1 Dec '90	WTB2 Sep '91	WTB2 Dec '90	WTB3 Sep '91	WTB3 Dec '90	WTB4 Dec '90	WTB4 Sep'91	WT102A Jan '91	WT102A Sep '91	WT102A Nov'90	WT102B Sep'91	WT102C Sep '91
Antimony	31.0 U	31.0 U	13.0 U	48.7 B	13.0 U	36.0 B	13.0 U	37.0 U	30.0 U	13.0 U	13.0 U	13.0 U
Antimony (dissolved)	31.0 U	31.0 U	13.0 U	63.4	13.0 U	35.2 B	13.7 BJ	37.0 U	30.0 U	13.0 U	13.0 U	13.0 U
Arsenic	3.0 U	3.0 U	5.3 BJ	5.8 B	4.0 B	2.0 U	2.0 UJ	3.0 U	1.0 U	2.0 U	2.0 UJ	2.0 UJ
Arsenic (dissolved)	3.0 U	3.0 U	2.0 U	2.0 U	2.0 UJ	2.0 U	2.0 UJ	3.0 UJ	1.1 BJ	2.0 U	2.0 U	2.0 U
Barium	116.0 B	22.5 B	124.0 B	63.6 B	57.2 B	40.4 B	35.4 B	60.3 B	65.5 B	56.5 B	85.1 B	63.0 B
Barium (dissolved)	112.0 B	20.0 B	72.8 B	63.0 B	56.3 B	36.0 B	36.4 B	59.1 B	61.5 B	56.0 B	83.8 B	66.2 B
Beryllium	3.0 U	3.0 U	1.0 U	5.0 U	1.0 U	3.0 U	1.0 UJ	3.1 BJ	1.2 B	1.0 U	1.0 U	1.0 U
Beryllium (dissolved)	3.0 U	3.0 U	1.0 U	3.0 U	1.0 U	3.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cadmium	5.0 UJ	5.0 UJ	1.0 U	5.0 U	1.0 U	5.0 U	1.0 U	4.0 U	3.0 U	1.0 U	1.0 U	1.0 U
Cadmium (dissolved)	5.0 UJ	5.0 UJ	1.0 U	5.0 U	1.0 U	5.0 U	1.0 U	4.0 U	3.0 U	1.0 U	1.0 U	1.0 U
Chromium	6.0 U	20.9	26.4	6.0 U	2.0 U	6.0 U	2.0 U	6.5 BJ	5.0 U	2.8 B	2.0 U	2.0 U
Chromium (dissolved)	6.0 U	6.0 U	2.0 U	6.0 U	2.0 U	6.0 U	2.0 U	4.0 U	5.0 U	2.0 U	2.0 U	2.0 U
Lead	10.2 J	20.0 UJ	91.2	20.0 UR	3.5 J	58.0 J	6.5	1.0 UJ	2.2 BJ	1.0 U	1.0 UJ	1.0 UJ
Lead (dissolved)	2.0 UJ	20.0 UJ	1.0 UJ	20.0 UR	1.0 UJ	2.0 UR	29.6 BJ	1.0 UJ	1.0 U	1.0 U	1.0 UJ	1.0 UJ
Mercury	0.2 UJ	0.2 UJ	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Mercury (dissolved)	0.2 UJ	0.2 UJ	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Vanadium	6.8 U	8.5 U	26.8 B	14.1 BJ	2.0 U	8.5 BJ	2.0 U	3.0 UJ	3.0 UJ	3.0 UJ	3.0 U	2.0 U
Vanadium (dissolved)	7.1 U	8.9 U	2.1 BJ	12.5 BJ	2.0 U	8.9 BJ	2.0 U	4.0 U	3.0 U	2.0 U	2.0 U	2.0 U
Cyanide	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 UR	10.0 U	10.0 U	10.0 U
Nitrogen, Nitrate + Nitrite	0.17 R	5.4 R	5.48 J	0.28 R	0.02 JU	40.1 U	0.02 JU	6.4 R	6.9 J	3.48 UJ	0.02 JU	0.02 JU

U – The compound was analyzed for, but not detected. The associated numerical value is the sample quantification limit.

J – The associated numerical value is an estimated quantity.

R – Quality control indicates that the data are unusable (compound may or may not be present). Resampling and/or re–analysis is necessary for verification.

B – Reported value is less than the contract required detection limit, but greater than the instrument detection limit.

TABLE 5

HIMCO DUMP SUPERFUND SITE

PROPOSED LEVELS TO TRIGGER A GROUNDWATER STUDY FOR VOLATILE ORGANIC COMPOUNDS

Contaminant	CRQL (ug/L)	ARARs MCL (ug/L)	95% UCL (TL) * X + KS (ug/L)	Proposed Level to Trigger Active Remediation (1) (ug/L)
1–1 Dichloroethene	5.00	7.0	–	7.00
Chloroform	5.00	100.0 (2)	29.612	100.00
Bromodichloromethane	5.00	100.0 (2)	9.397	100.00
Benzene	5.00	5.0	–	5.00
Carbon disulfide	5.00	n/a	–	5.00
Methylene chloride	5.00 (3)	5.0	17.701	18.00
Styrene	5.00	5.0	–	10.00
Tetrachloroethene	5.00	5.0	–	5.00
Vinyl chloride	10.00	2.0	–	2.00

(dis) Dissolved

(1) Proposed level is the highest value taken from the CRQLs, MCLs, and 95% UCLs, columns.

(2) Used trihalomethane MCL and total concentration for chloroform and bromodichloromethane should not exceed MCL for trichloromethane.

(3) Common laboratory solvent. Control limits for balnks are 5 times the Method Detection Limit (MDL).

n/a information not available

* For 95% UCL (TL) values not listed in the table, the calculations were not completed because the contaminant was not detected at any background wells.

CRQL – Contract Required Quantitation Limit

ARARs – Applicable or Relevant and Appropriate Requirements

MCL – Maximum Contaminant Level

UCL – Upper Control Limit

TL – Tolerance Level

TABLE 5A

HIMCO DUMP SUPERFUND SITE

CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS IN BACKGROUND WELLS

Contaminant / Well # / Month (period)	WTB1 Dec '90	WTB2 Sep '91	WTB2 Dec '90	WTB3 Sep '91	WTB3 Dec '90	WTB4 Dec '90	WTB4 Sep'91	WT102A Jan '91	WT102A Sep '91	WT102A Nov'90	WT102B Sep'91	WT102C Sep '91
1-1 Dichloroethene	5.0 U	10.0 U	5.0 U	10.0 U	5.0 U	5.0 U	10.0 U	5.0 U	10.0 U	5.0 U	10.0 U	10.0 U
Chloroform	5.0 U	10.0 U	5.0 U	10.0 U	5.0 U	5.0 U	23.0	5.0 U	10.0 U	5.0 U	10.0 U	10.0 U
Bromodichloromethane	6.0	10.0 U	5.0 U	7.0 J	5.0 U	2.0 J	7.0 J	5.0 U	10.0 U	5.0 U	10.0 U	10.0 U
Benzene	5.0 U	10.0 U	5.0 U	10.0 U	5.0 U	5.0 U	10.0 U	5.0 UJ	10.0 U	5.0 U	10.0 U	10.0 U
Carbon Disulfide	5.0 U	10.0 U	5.0 U	10.0 U	5.0 U	5.0 U	10.0 U	5.0 U	10.0 U	5.0 U	10.0 U	10.0 U
Methylene Chloride	5.0 U	10.0 U	5.0 U	10.0 U	5.0 U	5.0 U	10.0 U	19.0 J	10.0 U	1.0 BJ	10.0 U	10.0 U
Styrene	5.0 U	10.0 U	5.0 U	10.0 U	5.0 U	5.0 U	10.0 U	5.0 U	10.0 U	5.0 U	10.0 U	10.0 U
Tetrachloroethene	5.0 U	10.0 U	5.0 U	10.0 U	5.0 U	5.0 U	10.0 U	5.0 U	10.0 U	5.0 U	10.0 U	10.0 U
Vinyl Chloride	5.0 U	10.0 U	5.0 U	10.0 U	5.0 U	5.0 U	10.0 U	10.0 U	10.0 UR	10.0 U	10.0 UR	10.0 UR

U – The compound was analyzed for, but not detected. The associated numerical value is the sample quantification limit.

J – The associated numerical value is an estimated quantity.

R – Quality control indicates that the data are unusable (compound may or may not be present). Resampling and/or re-analysis is necessary for verification.

B – Reported value is less than the contract required detection limit, but greater than the insturment detection limit.

TABLE 6

HIMCO DUMP SUPERFUND SITE

PROPOSED LEVELS TO TRIGGER A GROUNDWATER STUDY FOR SEMIVOLATILE ORGANIC COMPOUNDS

Contaminant	CRQL (ug/L)	ARARs MCL (ug/L)	95% UCL (TL) * X + KS (ug/L)	Proposed Level to Trigger Active Remediation (1) (ug/L)
1–4 Dichlorobenzene	10.00	75.0	–	75.00
Phenthrene	10.00	n/a	–	10.00
Benzo (a) anthracene	10.00 (2)	n/a	–	10.00
Benzo (b) fluoranthene	10.00 (3)	n/a	–	10.00
Benzo (k) fluoranthene	10.00 (3)	n/a	–	10.00
Benzo (a) pyrene	10.00	0.20	–	0.20
Indeno (1,2,3–cd) pyrene	10.00	n/a	–	10.00
Chrysene	10.00 (2)	n/a	–	10.00

(dis) Dissolved

(1) Proposed level is the highest value taken from the CRQLs, MCLs, and 95% UCLs, columns.

(2) (3) These compounds are reported as a total.

n/a information not available

* For 95% UCL (TL) values not listed in the table, the calculations were not completed because the contaminant was not detected at any background wells.

CRQL – Contract Required Quantitation Limit

ARARs – Applicable or Relevant and Appropriate Requirements

MCL – Maximum Contaminant Level

UCL – Upper Control Limit

TL – Tolerance Level

TABLE 6A

HIMCO DUMP SUPERFUND SITE

CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS IN BACKGROUND WELLS

Contaminant / Well # / Month (period)	WTB1 Dec '90	WTB2 Sep '91	WTB2 Dec '90	WTB3 Sep '91	WTB3 Dec '90	WTB4 Dec '90	WTB4 Sep'91	WT102A Jan '91	WT102A Sep '91	WT102A Nov'90	WT102B Sep'91	WT102C Sep '91
1-4 Dichlorobenzene	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Phenanthrene	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Benzo (a) anthracene	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Benzo (b) fluoranthene	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Benzo (k) fluoranthene	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Benzo (a) pyrene	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Indeno (1,2,3-cd) pyrene	10.0 U	10.0 UJ	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 UJ	10.0 U	10.0 UJ	10.0 U	10.0 U
Chrysene	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U

U – The compound was analyzed for, but not detected. The associated numerical value is the sample quantification limit.
J – The associated numerical value is an estimated quantity.
R – Quality control indicates that the data are unusable (compound may or may not be present). Resampling and/or re-analysis is necessary for verification.
B – Reported value is less than the contract required detection limit, but greater than the insturment detection limit.

APPENDIX A9

Discharge to the City of Elkhart POTW, Telephone Conversation

TELEPHONE CONVERSATION LOG

EPA Region V ARCS Contract No. 68-W8-0093

Project No. 20026.002
Date: 7/28/92
Time: 0855

Work Assignment Name: Himco Dump

Subject: Disposal of Leachate from Himco

SEC Donohue Staff: Bill Schaefer

CC: Mehdi Geraminegad

Outside Party: John Blakeslee
Elkhart Wastewater Department
219/293-2572

Summary of Conversation:

I asked Blakeslee whether the Elkhart Wastewater Department has a policy regarding accepting leachate from landfills. He stated that Elkhart wastewater is currently accepting wastewater from two landfills. However, the leachate is pre-treated in both cases.

Elkhart Wastewater would consider accepting Himco leachate. However, the leachate would need to be pre-treated to reduce VOC and metals content before the plant would accept it. Also, Elkhart Wastewater would accept the leachate only for a short term duration (i.e., 3-6 months). Elkhart Wastewater would not like to get into a situation where they are accepting the leachate for years. J. Blakeslee stated that Elkhart Wastewater does not want to be our long-term solution to pollution.

An agreement between SEC Donohue/EPA and Elkhart would need to be drafted describing pre-treatment requirements, volumes to be disposed, costs, etc.

TELEPHONE CONVERSATION LOG

EPA Region V ARCS Contract No. 68-W8-0093

Project No.	20026.043
Date:	8/3/92
Time:	1115
Work Assignment Name:	Himco Dump
Subject:	Distance requiring sewer connection for POTW discharge
SEC Donohue Staff:	Karen Roberts
CC:	Mehdi Geraminegad
Outside Party:	Kent Schumacher, City Engineer Deptartment of Public Works 219/294-5471

Summary of Conversation:

I asked K. Schumacher where the closest sewer was to the Himco Dump Landfill in Elkhart, Indiana. He checked, and stated that the closest sewer line is at the intersection of Garvin Street and Kent. He also stated that the sewer is an 18-inch sewer pipe.

While on the phone he described the location as the intersection of the first road south of the beginning of Nappannee Street Extension and the first road west of Nappannee Street/County Road 10. From the scale on the map I measured approximately 1/2 mile along the road from this location to the Himco Dump site.

APPENDIX A10

Determination of the Zone Requiring Institutional Controls for Groundwater Use

TECHNICAL MEMORANDUM A10

DATE: August 5, 1992

TO: Himco File

FROM: Mehdi Geraminegad

SUBJECT: Determination of the Zone Requiring Institutional Controls for Groundwater Use
SEC Donohue Project No. 20026

Introduction

Institutional controls for groundwater use have been included in all alternatives, except the "no action alternative" to restrict pumping from the aquifer in the vicinity of the site. This restriction is required to assure that excessive pumping from the aquifer would not draw leachate from the landfill into the aquifer. In order to meet the above restriction, the following criterion has been developed:

- The radius of influence of the pumping well should not extend to the landfill.

Theoretical Calculation

The radius of influence of a pumping well is a function of the drawdown at the pumping well as well as permeability of the aquifer. The radius of influence may be calculated using the following equation:

$$R = CS (SQRT(K)) \quad \text{Eq. (1)}$$

Source: Foundation Engineering Haynes Davis, 1962, McGraw Hill Series in Soil Engineering and Foundation

where

K is permeability of the aquifer in 10^{-4} cm/sec and

C is a dimensionless coefficient ranging from 1.5 to 3

The drawdown at the pumping well under a steady state condition may be calculated using Thiem-Dupuit equation (a steady state condition is conservatively assumed for this calculation).

$$Q = \frac{2\pi KDS}{Ln\ (R/r)} \qquad \text{Eq. (2)}$$

where

K and D are permeability and thickness of the aquifer, S is drawdown at the pumping well, and R is the radius of influence under a pumping rate of Q, and r is the radius of the pumping well.

The following assumptions were made:

K = 466.2 gpd/sq ft (RI report, SEC Donohue, 1992)
D = 200 ft (RI Report, SEC Donohue, 1992)
r = 3-inch
C = 3 (coefficient in Eq. 1)

From equation 1, the radius of influence (R) can be calculated as:

$$R = 45\ S \qquad \text{(Eq. 3)}$$

Substituting Eq. 3 into Eq. 2 and using values assumed for r and D, the following relationship between Q and R can be found:

$$Q = \frac{1.2 \times R}{1.38 + LnR} \qquad \text{(Eq. 4)}$$

Equation 4 can be used to plot R versus Q (see Attachment). This plot can be used to restrict the pumping rate in the vicinity of the site.

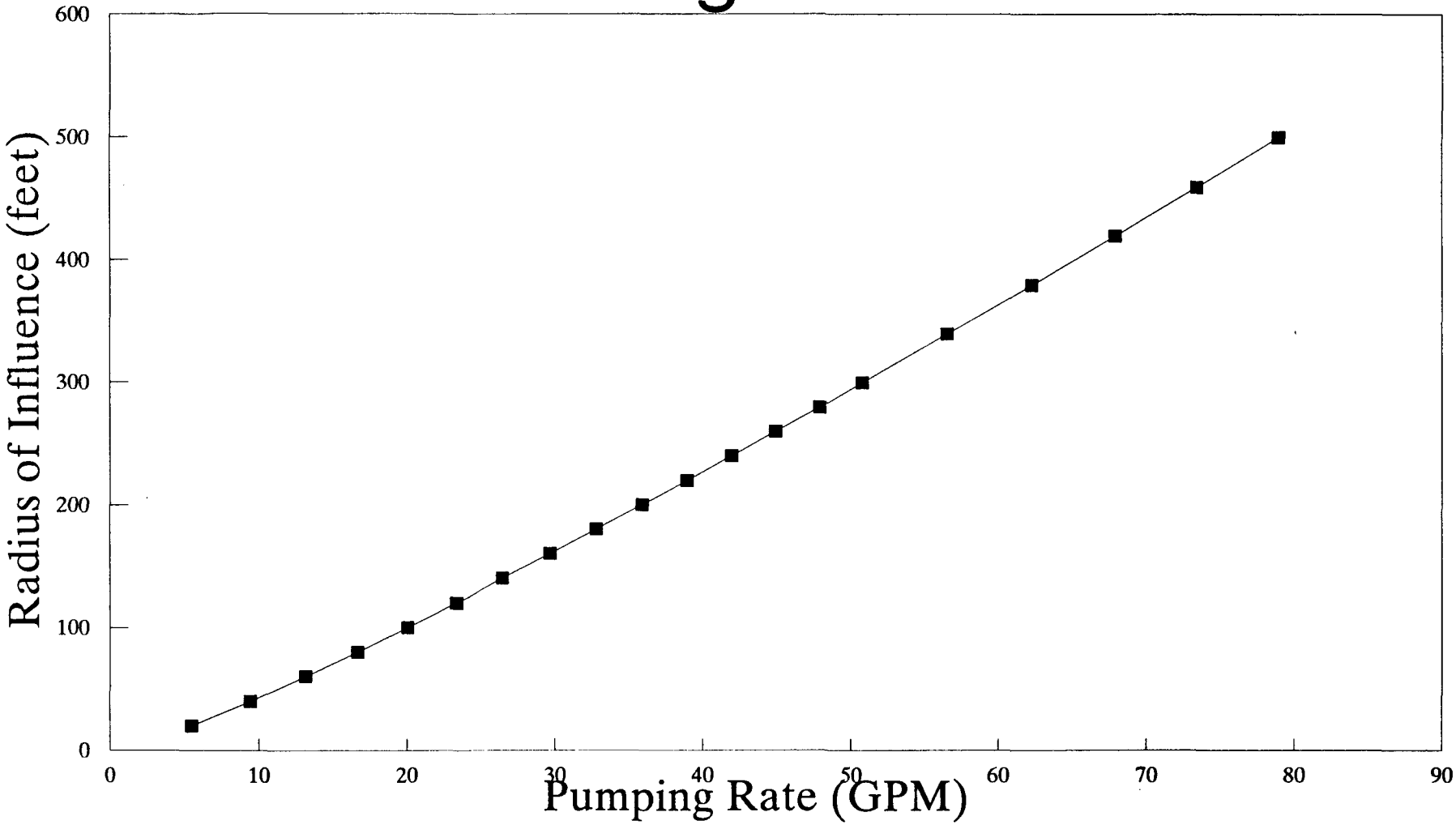
Conclusion

As shown in Figure 1, for a pumping rate of 5 gpm, the minimum distance required to the landfill should be approximately 20 feet. However, as the pumping rate increases, the minimum required distance from the landfill should increase. For example, for a pumping rate of 80 gpm, the minimum required distance should be 500 feet.

Attachments

A/R/HIMCO/AT4

Figure 1


Radius of Influence (feet)
600
500
400
300
200
100
0
0
10
20
30
40
50
60
70
80
90
Pumping Rate (GPM)

$$Q = \frac{1.2 * R}{1.386 + \text{Ln}R}$$

R = Radius of Influence (feet)

Q = Pumping Rate (GPM)

R	Q
20	5.477286
40	9.458353
60	13.13786
80	16.64347
100	20.02948
120	23.32554
140	26.55017
160	29.71596
180	32.83195
200	35.90494
220	38.94019
240	41.94192
260	44.91353
280	47.85786
300	50.7773
340	56.54928
380	62.24261
420	67.86732
460	73.43134
500	78.94105

APPENDIX B

DETAILED COST SUMMARIES

APPENDIX B1

COST ASSUMPTIONS

TABLE B1–1
COST ANALYSIS
INSTITUTIONAL CONTROL AND GROUNDWATER MONITORING
Himco Dump Superfund Site
Elkhart, Indiana

A.	Institutional Control	$45,055.00 l.s.
	Assume 6,770 ft. of chain link industrial fence, 8 feet high plus 3 strands of barbed wire, 4 gates each 20 feet wide over entire length of fence, includes warning signs of fence (Do–it–Yourself Co. quote)	
B.	Groundwater Monitoring Well Installation	
	Assume installation of 5 shallow (30 ft.) and 2 deep wells (70 ft.), well installation will take six days (includes one day for well development)	
	1. Mobilization/Demobilization	$1,600.00 l.s.
	2. Operator – assume 10 hours/day, 2 man crew	$1,375.00 /day
	3. Per diem – assume 2 man crew	$130.00 /day
	4. Steam cleaner and general rental fee	$95.00 /day
	5. 3" – PVC screen & riser (290 ft.) including threaded slip caps and plugs (7)	$22.75 /l.f.
	6. Grouting	$1,160.00 /well
	Assume 6 bags Silica sand , 4 – 5 gallon pails of bentonite pellets for a 10 ft. well, 4 bags cement, 1 bag bentonite powder	
	Average cost (2 – 70 ft. wells, 5 – 30 ft. wells) = $1160.00/ well	
	(D & G Drilling Inc. quote)	
C.	Groundwater Monitoring	
	Assume sampling will be conducted in 2 rounds per year, each consisting of 19 water samples	
	1. 240 professional hours per sampling round (SEC Donohue Inc. quote)	$50.00 /hour
	2. 38 samples analyzed for TAL and TCL per year (IEA, Inc. quote)	$1,900.00 /sample
	3. ODC's – include per diem, hotel, and equipment (SEC Donohue Inc. quote)	$2,000.00 /round

TABLE B1–2
COST ANALYSIS
SINGLE BARRIER SOLID WASTE CAP
Himco Dump Superfund Site
Elkhart, Indiana

The cap will be designed to cover the entire area of contamination as depicted (Refer to figure 1 in Appendix A6) for a total surface area of 2,522,600 square feet.

Topsoil Layer:
- Surface Area = 2,522,600 ft2
- Thickness = 1.5 ft
- Total Volume = 2,522,600 ft2 x 1.5 ft = 140,000 cu. yd.
- Bulk Volume = 140,000 * 1.1 = 154,000 cu. yd.

Drainage Layer:
- Surface Area = 2,522,600 ft2
- Thickness = 0.5 ft
- Total Volume = 2,522,600 ft2 x 0.5 ft = 46,700 cu. yd.
- Bulk Volume = 46,700 * 1.15 = 53,700 cu. yd.

Clay Cap Layer:
- Surface Area = 2,522,600 ft2
- Thickness = 2.0 ft
- Total Volume = 2,522,600 ft2 x 2.0 ft = 186,700 cu. yd.
- Bulk Volume = 186,700 * 1.2 = 224,000 cu. yd.

Buffer Layer:
- Average Thickness = 2.15 ft
- Total Volume = 165,500 cu. yd.
- Bulk Volume = 165,500 * 1.15 = 190,300 cu. yd.

Fertilizer/Seeding:*
- Surface Area = 2,522,600 ft2

A.	Mobilization/Demobilization (SEC Donohue Inc.) estimate is based on experience in similar projects.	$10,000.00 l.s.
B.	Clearing (light clearing of shrubs, etc. with dozer) Surface Area = 2,522,600 ft2 = 57.9 acres (Means (Const.) 1992, Page 36: Division 021–108–0300)	$710.00 /acre
C.	Topsoil	
	1. Material and Haul Assume topsoil bulk volume of 154,000 cu. yd. transported from local vendor (Elkhart County Gravel Corp. estimate)	$7.00 /cu. yd.
	2. Placement Assume grading using 300 H.P. dozer, 300 ft. haul, 600 cu. yd./day (Means (Const.) 1992, Page 48, Division: 022–262–0190)	$2.29 /cu. yd.
	Topsoil Total:	$9.29 /cu. yd.
D.	Drainage Layer	
	1. Material and Haul Assume sand bulk voume of 53,700 cu. yd. transported from local vendor (Elkhart County Gravel Corp. estimate)	$5.00 /cu. yd.
	2. Placement Assume grading using 300 H.P. dozer, 300 ft. haul, 600 cu. yd./day (Means (Const.) 1992, Page 48, Division: 022–262–0190)	$2.29 /cu. yd.
	Drainage Layer Total:	$7.29 /cu. yd.

* Seeding with the prairie assemblage currently existing at this site may be considered during the design phase.

TABLE B1–2 (cont.)
COST ANALYSIS
SINGLE BARRIER SOLID WASTE CAP
Himco Dump Superfund Site
Elkhart, Indiana

E.	Clay Cap Layer	
	1. Material and Haul Assume clay bulk volume of 224,000 cu. yd. transported from local vendor (Elkhart County Gravel Corp. estimate)	$5.00 /cu. yd.
	2. Placement Assume grading using 300 H.P. dozer, 300 ft. haul (Means (Const.) 1992, Page 48, Division: 022–262–0190)	$2.29 /cu. yd.
	3. Compaction Assume sheepsfoot roller, 6 inch lifts, 2 passes (Means (Const.) 1992, Page 42, Division: 022–226–5600)	$0.36 /cu. yd.
	Clay Cap Layer Total:	$7.65 /cu. yd.
F.	Buffer Layer	
	1. Material and Haul Assume common earth bulk volume of 190,300 cu. yd. transported from local vendor (Elkhart County Gravel Corp. estimate)	$5.00 /cu. yd.
	2. Placement Assume grading using 300 H.P. dozer, 300 ft. total (Means (Const.) 1992, Page 48, Division: 022–262–0190)	$2.29 /cu. yd.
	3. Compaction Assume riding vibrating roller, 6 inch lifts, 2 passes (Means (Const.) 1992, Page 42, Division: 022–226–5000)	$0.28 /cu. yd.
	Buffer Layer Total:	$7.57 /cu. yd.
G.	Drainage Piping	
	1. 4" PVC – perforated, 10 ft. lengths, S.D.R. 35 (4,200 ft.) (Means (Const.) 1992, Page 84, Division: 027–114–0020)	$2.79 /l.f.
	2. 6" PVC – 10 ft. lengths, S.D.R. 35 (1,000 ft.) (Means (Const.) 1992, Page 90, Division: 027–168–2040)	$4.00 /l.f.
H.	Fertilizer (Means (Const.) 1992, Page 106, Division 029–720–0100)	$11.05 /M.S.F*
I.	Seeding (Utility mix)** (Means (Const.) 1992, Page 103, Division 029–308–5300)	$20.00 /M.S.F*
J.	Maintain Cover	
	1. Assume replacement of 2.5% of top six inches of topsoil cover yearly 2.5% of 46,700 cu.yd. = 1168 cu.yd.	$35,200.00 /year
	2. Assume seeding and fertilizing (20% of the initial cost @ $6.21/M.S.F.) once per year and grass cutting 12 times per year @ $1,000 each time. (Dominic's Lawn Service)	$27,700.00 /year
	$6.21*2,522.6 + $12,000 = $27,665.3 = approx. $27,700	
K.	5– year review Assume a 5–year review @ $4,600 ($815.00 = yearly equivalent) (SEC Donohue Inc.)	$815.00 /year

*M.S.F. = 1,000 square feet

** Seeding with the prairie assemblage currently existing at this site may be considered during the design phase.

TABLE B1–3
COST ANALYSIS
COMPOSITE BARRIER SOLID WASTE CAP
Himco Dump Superfund Site
Elkhart, Indiana

The cap will be designed to cover the entire area of contamination as depicted (Refer to figure 1 in Appendix A6) for a total surface area of 2,522,600 square feet.

Topsoil Layer:
- Surface Area = 2,522,600 ft2
- Thickness = 1.5 ft
- Total Volume = 2,522,600 ft2 x 1.5 ft = 140,000 cu. yd.
- Bulk Volume = 140,000 *1.1 = 154,000 cu. yd.

Drainage Layer:
- Surface Area = 2,522,600 ft2
- Thickness = 0.5 ft
- Total Volume = 2,522,600 ft2 x 0.5 ft = 46,700 cu. yd.
- Bulk Volume = 46,700 * 1.15 = 53,700 cu. yd.

Liner:
- Surface Area = 2,522,600 ft2

Clay Cap Layer:
- Surface Area = 2,522,600 ft2
- Thickness = 2.0 ft
- Total Volume = 2,522,600 ft2 x 2.0 ft = 186,700 cu. yd.
- Bulk Volume = 186,700 *1.2 = 224,000 cu. yd.

Buffer Layer:
- Average Thickness = 2.15 ft
- Total Volume = 165,500 cu.yd.
- Bulk Volume = 165,500 * 1.15 = 190,300 cu. yd.

Fertilizer/Seeding:*
- Surface Area = 2,522,600 ft2

A.	Mobilization/Demobilization (SEC Donohue Inc.) estimate is based on experience in similar projects.	$10,000.00 l.s.
B.	Clearing (light clearing of shrubs, etc. with dozer) Surface Area = 2,522,600 ft2 = 57.9 acres (Means (Const.) 1992, Page 36: Division 021–108–0300)	$710.00 /acre
C.	Topsoil	
	1. Material and Haul Assume topsoil bulk volume of 154,000 cu. yd. transported from local vendor (Elkhart County Gravel Corp. estimate)	$7.00 /cu. yd.
	2. Placement Assume grading using 300 H.P. dozer, 300 ft. haul, 600 cu. yd./day (Means (Const.) 1992, Page 48, Division: 022–262–0190)	$2.29 /cu. yd.
	Topsoil Total:	$9.29 /cu. yd.
D.	Drainage Layer	
	1. Material and Haul Assume sand bulk voume of 53,700 cu. yd. transported from local vendor (Elkhart County Gravel Corp. estimate)	$5.00 /cu. yd.
	2. Placement Assume grading using 300 H.P. dozer, 300 ft. haul, 600 cu. yd./day (Means (Const.) 1992, Page 48, Division: 022–262–0190)	$2.29 /cu. yd.
	Drainage Layer Total:	$7.29 /cu. yd.

* Seeding with the prairie assemblage currently existing at this site may be considered during the design phase.

TABLE B1–3 (cont.)
COST ANALYSIS
COMPOSITE BARRIER SOLID WASTE CAP
Himco Dump Superfund Site
Elkhart, Indiana

E.	Liner Material for Cap (including installation) 40 mil HDPE liner (Gundle quote)	$0.40 /sq. ft.
F.	Clay Cap Layer	
	1. Material and Haul Assume clay bulk volume of 224,000 cu. yd. transported from local vendor (Elkhart County Gravel Corp. estimate)	$5.00 /cu. yd.
	2. Placement Assume grading using 300 H.P. dozer, 300 ft. haul (Means (Const.) 1992, Page 48, Division: 022–262–0190)	$2.29 /cu. yd.
	3. Compaction Assume sheepsfoot roller, 6 inch lifts, 2 passes (Means (Const.) 1992, Page 42, Division: 022–226–5600)	$0.36 /cu. yd.
	Clay Cap Layer Total:	$7.65 /cu. yd.
G.	Buffer Layer	
	1. Material and Haul Assume common earth bulk volume of 190,300 cu. yd. transported from local vendor (Elkhart County Gravel Corp. estimate)	$5.00 /cu. yd.
	2. Placement Assume grading using 300 H.P. dozer, 300 ft. total (Means (Const.) 1992, Page 48, Division: 022–262–0190)	$2.29 /cu. yd.
	3. Compaction Assume riding vibrating roller, 6 inch lifts, 2 passes (Means (Const.) 1992, Page 42, Division: 022–226–5000)	$0.28 /cu. yd.
	Buffer Layer Total:	$7.57 /cu. yd.
H.	Drainage Piping	
	1. 4" PVC – perforated, 10 ft. lengths, S.D.R. 35 (4,200 ft.) (Means (Const.) 1992, Page 84, Division: 027–114–0020)	$2.79 /l.f.
	2. 6" PVC – 10 ft. lengths, S.D.R. 35 (1,000 ft.) (Means (Const.) 1992, Page 90, Division: 027–168–2040)	$4.00 /l.f.
I.	Fertilizer (Means (Const.) 1992, Page 106, Division 029–720–0100)	$11.05 /M.S.F*
J.	Seeding (Utility mix)** (Means (Const.) 1992, Page 103, Division 029–308–5300)	$20.00 /M.S.F*
K.	Maintain Cover	
	1. Assume replacement of 2.5% of top 6 inches of topsoil cover yearly 2.5% of 46,700 cu.yd. = 1168 cu.yd.	$35,200.00 /year
	2. Assume seeding and fertilizing (20% of the initial cost @ $6.21/M.S.F.) once per year and grass cutting 12 times per year @ $1,000 each time. (Dominic's Lawn Service) $6.21*2,522.6 + $12,000 = $27,665.3 = approx. $27,700	$27,700.00 /year
L.	5– year review Assume a 5–year review @ $4,600 ($815.00 = yearly equivalent) (SEC Donohue Inc.)	$815.00 /year

*M.S.F. = 1,000 square feet
** Seeding with the prairie assemblage currently existing at this site may be considered during the design phase.

TABLE B1–4
COST ANALYSIS
ACTIVE GAS COLLECTION & TREATMENT
Himco Dump Superfund Site
Elkhart, Indiana

A.	Gas Well Installation Assume 32 gas collection wells installed, well installation in 11 days	
	1. Mobilization/Demobilization	$1,600.00 /l.s.
	2. Operator – assume 10 hours/day, 2 man crew	$1,375.00 /day
	3. Per diem – assume 2 man crew	$130.00 /day
	4. Steam and general rental fee (D & G Drilling Inc. quote)	$95.00 /day
B.	Piping	
	1. 3" – PVC screen & riser (640 ft.) *including threaded slip caps and plugs (32)* (D & G Drilling Inc. quote)	$22.75 /l.f.
	2. Header pipe – 3" PVC sch. 40 w/ fittings & labor (7,000 ft.) (Means (Const.) 1992, page 204: Division 151–551–0740)	$10.01 /l.f.
	3. Header pipe – 4" PVC sch. 40 w/ fittings & labor (3,000 ft.) (Means (Const.) 1992, page 204: Division 151–551–0750)	$12.23 /l.f.
	4. Trenching (including backfilling) – 1,000 ft. Assume 1 to 1 slope, 4 ft. deep, 2 ft. wide, 3/8 c.y. backhoe (Means (Const.) 1992, page 273: Division 12.3–110–3540) (Means (Const.) 1992, page 275: Division 12.3–310–1440)	$7.60 /l.f.
C.	Grouting Assume 6 bags Silica Sand, 4–5 gallon Pails Bentonite Pellets, 4 bags cement, 1 bag Bentonite powder (D & G Drilling, Inc. quote)	$368.00 /well
D.	Vapor Phase Carbon Adsorption (VPAC) 4 units (each unit 110 gallon capacity) (Calgon quote)	$1,200.00 /unit
E.	Structural Support Concrete pad and protection shed for VPAC units (SEC Donohue Inc.)	$22,500.00 l.s.
F.	Vacuum Pump/Blower 1 – 1000 SCFM (Dressor Industries quote)	$18,000.00 /unit
G.	Primary electrical power feed to the facility, and transformer 400 l.f. – 3 wire 13,800 Vac power lines in 3" conduit w/ 13,800/480 VAC transformer (SEC Donohue Inc. Architectural Division estimate)	$13,000.00 l.s.
H.	Secondary electric distribution 60 l.f. – 3 wire 480 Vac distribution lines in 2" conduit w/ 1 MCC unit, lighting and instrument transformers and panels, and 200 l.f. 1"conduit (SEC Donohue Inc. Architectural Division estimate)	$40,000.00 l.s.
I.	Area lighting and service power 4 outside lighting units, and 100 l.f. 1" conduit and wire (SEC Donohue Inc. Architectural Division estimate)	$2,000.00 l.s.

TABLE B1–4 (cont.)
COST ANALYSIS
ACTIVE GAS COLLECTION & TREATMENT
Himco Dump Superfund Site
Elkhart, Indiana

J.	Instruments, alarms, and auxillary controls Instrument and panel, 400 l.f. conduit wire (SEC Donohue Inc. Architectural Division estimate)	$6,000.00 l.s.
K.	Electric pipe tracing, and controls 200 l.f. electric pipe tracing, conduit and wire (SEC Donohue Inc. Architectural Division estimate)	$2,000.00 l.s.
L.	Start–up Sampling Assume 4 samples for start–up of VPAC units (Pace Lab quote)	$340.00 /sample
M.	Activated Carbon Disposal – one time fee (Chemical Waste Management quote)	$1,000.00 l.s.
N.	Sampling and Analysis 8 samples yearly (Pace Lab quote)	$340.00 /sample
O.	Operating Costs	
	1. Assume – 8 VPAC changes/year	
	VPAC unit replacement (Calgon quote)	$600.00 /change
	VPAC unit disposal – incineration (includes TCLP sampling) (Chemical Waste Management estimate)	$1,750.00 /change
	VPAC Cost:	$2,350.00 /change
	2. Labor at 1 hour a day for 260 days/yr (SEC Donohue Inc. quote)	$40.00 /day
	3. 2 gas well installations/year (SEC Donohue Inc. quote)	$1,600.00 /year
	4. Electric Utilization – 193,000 kw–hr/yr (SEC Donohue quote)	$0.10 /kw–hr
P.	Equipment Maintenance (SEC Donohue quote)	$5,000.00 /year

TABLE B1–5
COST ANALYSIS
LEACHATE COLLECTION SYSTEM
Himco Dump Superfund Site
Elkhart, Indiana

A.	Leachate Collection Well Installation	
	Assume 680 wells installed, well installation in 150 days	
	1. Mobilization/Demobilization	$1,600.00 /l.s.
	2. Operator – assume 10 hours/day, 2 man crew	$1,375.00 /day
	3. Per diem – Assume 2 man crew	$130.00 /day
	4. Steam and general rental	$95.00 /day
	5. 3" – PVC screen & riser (13,600 ft.) including threaded slip caps and plugs (680) (D & G Driling Inc. quote)	$22.75 /l.f.
	6. Grouting Assume 6 bags Silica sand, 4 – 5 gallon pails of Bentonite pellets, 4 bags cement, 1 bag Bentonite powder (D & G Drilling Inc. quote)	$368.00 /well
B.	Header Piping	
	1. 1 1/2" PVC pipe (41,400 ft.) (Means (Const.) 1992, page 204: Division 151–551–0710)	$6.98 /l.f.
	2. 2" PVC pipe (550 ft.) (Means (Const.) 1992, page 204: Division 151–551–0720)	$7.89 /l.f.
	3. 3" PVC pipe (550 ft.) (Means (Const.) 1992, page 204: Division 151–551–0740)	$10.01 /l.f.
	4. 4" PVC pipe (700 ft.) (Means (Const.) 1992, page 204: Division 151–551–0750)	$12.23 /l.f.
	5. Trenching (including backfilling) – 1,000 ft. Assume 1 to 1 slope, 4 ft. deep, 2 ft. wide, 3/8 c.y. backhoe (Means (Const.) 1992, page 273: Division 12.3–110–3540) (Means (Const.) 1992, page 275: Division 12.3–310–1440)	$7.60 /l.f.
C.	Air Piping	
	1. 1" Black Steel Pipe (39,900 ft.) (Means (Const.) 1992, page 208: Division 151–701–0580)	$7.70 /l.f.
	2. 1 1/2" Black Steel Pipe (500 ft.) (Means (Const.) 1992, page 208: Division 151–701–0600)	$9.65 /l.f.
	3. 2" Black Steel Pipe (550 ft.) (Means (Const.) 1992, page 208: Division 151–701–0610)	$12.35 /l.f.
	4. 3" Black Steel Pipe (550 ft.) (Means (Const.) 1992, page 208: Division 151–701–0630)	$21.00 /l.f.
	5. 4" Black Steel Pipe (700 ft.) (Means (Const.) 1992, page 208: Division 151–701–0650)	$28.00 /l.f.
	6. Trenching (including backfilling) – 1,000 ft. Assume 1 to 1 slope, 4 ft. deep, 2 ft. wide, 3/8 c.y. backhoe (Means (Const.) 1992, page 273: Division 12.3–110–3540) (Means (Const.) 1992, page 275: Division 12.3–310–1440)	$7.60 /l.f.
D.	Instrument air compressor, receiving tank, air dryers, and distribution piping	
	1 – 500 CFM instrument air compressor w/ air dryer	$7,000.00 /unit
	1 – 500 cu.ft. C.S. receiving tank	$2,500.00 /unit
E.	Electric pipe tracing and controls for air compressor 200 l.f. – 3" C.S. pipe	$1,000.00 l.s.
F.	Ejector Pumps Assume one pump in each well, 0–1 GPM (Ejector Systems, Inc. quote)	$4,000.00 /unit

TABLE B1–5 (cont.)
COST ANALYSIS
LEACHATE COLLECTION SYSTEM
Himco Dump Superfund Site
Elkhart, Indiana

G.	Prefabricated metal building (for storage tank shelter/containment) 1,800 sq. ft.(30' x 60' x 30'ht – single span) (Assuming $25/sq. ft.) (SEC Donohue Inc. quote)	$45,000.00 l.s.
H.	Secondary electric distribution 60 l.f. – 3 wire 480 Vac distribution lines in 2" conduit w/ 1 MCC unit, lighting and instrument transformers and panels, and 600 l.f. 1"conduit (SEC Donohue Inc. Architectural Division estimate)	$50,000.00 l.s.
I.	Area lighting and service power 36 Inside lighting units, 4 outside lighting units, and 400 l.f. 1" conduit and wire (SEC Donohue Inc. Architectural Division estimate)	$19,300.00 l.s.
J.	Instruments, alarms, and auxillary controls Instrument and fire alarm panels, 400 l.f. conduit wire (SEC Donohue Inc. Architectural Division estimate)	$12,000.00 l.s.
K.	Electric pipe tracing, and controls 400 l.f. electric pipe tracing, conduit and wire (SEC Donohue Inc. Architectural Division estimate)	$5.00 /l.f.
L.	Ventilation unit for building 1 – 7,200 SCFM roof ventilator (SEC Donohue Inc. Architectural Division estimate)	$4,000.00 /unit
M.	FRP Storage Tanks 3 FRP tanks 10' diameter 12' deep (9,000 gal.) (Corrosion Resistant Systems quote)	$13,050.00 /unit
N.	Gate valves 10 – 3" valves (Means (Const.) 1992, page 220: Division 151–980–2050)	$830.00 /unit
O.	Centrifugal Pump 1 – 2" discharge x 3" suction, 15 HP (Means (Const.) 1992, page 221: Division 152–430–2140)	$5,650.00 /unit
P.	Leachate distribution piping 3" black steel pipe (150 ft.) (Means (Const.) 1992, page 208: Division 151–701–0630)	$21.00 /l.f.
Q.	Start–up Sampling Assume 10 samples analyzed for TAL & TCL needed for start–up of leachate system (IEA, Inc. quote)	$1,900.00 /sample
R.	Electric Utilization Assume 129,000 k.w.–hr/year (SEC Donohue Inc. quote)	$0.10 /kw–hr
S.	Sampling and Analysis 8 confirmatory samples yearly analyzed for TAL & TCL (IEA, Inc. quote)	$1,900.00 /sample

TABLE B1–5 (cont.)
COST ANALYSIS
LEACHATE COLLECTION SYSTEM
Himco Dump Superfund Site
Elkhart, Indiana

T.	Leachate Transportation and Disposal Assume 1,880,000 gallons of leachate collected under a single barrier cap each year (Clean Harbors Quote)	$0.35 /gal.
U.	Equipment Maintenance Assume maintenance costs are $2,000/year (SEC Donohue Inc. quote)	$2,000.00 /year
V.	Operating Labor Assume 2100 man hours per year (SEC Donohue Inc. quote)	$40.00 /hour

APPENDIX B2

COST SUMMARY
&
COST MODULES

TABLE B2–1
COST MODULE
INSTITUTIONAL CONTROL AND GROUNDWATER MONITORING
Himco Dump Superfund Site
Elkhart, Indiana

I.	CAPITAL COST	QUANTITY	UNIT COST	COST
	A. Institutional Control	1	$45,055.00 l.s.	$45,055
	B. Groundwater Monitoring Well Installation			
	1. Mobilization/Demobilization	1	$1,600.00 l.s.	$1,600
	2. Operator	6 days	$1,375.00 /day	$8,250
	3. Per Diem	6 days	$130.00 /day	$780
	4. Rental Fee	6 days	$95.00 /day	$570
	5. Screen & Riser	290 feet	$22.75 /l.f.	$6,598
	6. Grouting	7 wells	$1,160.00 /well	$8,120
	TOTAL CAPITAL COST			$71,000
II.	ANNUAL OPERATION AND MAINTENANCE COST			
	A. Groundwater Monitoring			
	1. Professional Hours	240 hours	$50.00 /hour	$12,000
	2. Sample Analysis	38 samples	$1,900.00 /sample	$72,200
	3. ODC's	2 rounds	$2,000.00 /round	$4,000
	TOTAL ANNUAL O&M COST			$88,000

TABLE B2-2
COST MODULE
SINGLE BARRIER SOLID WASTE CAP
Himco Dump Superfund Site
Elkhart, Indiana

I.	CAPITAL COST	QUANTITY	UNIT COST	COST
A.	Mobilization/Demobilization	1	$10,000.00 l.s.	$10,000
B.	Clearing and Grubbing	57.9 acres	$710.00 /acre	$41,109
C.	Topsoil	154,000 cu.yd.	$9.29 /cu.yd.	$1,430,660
D.	Drainage Layer	53,700 cu.yd.	$7.29 /cu.yd.	$391,473
E.	Clay Cap Layer	224,000 cu.yd.	$7.65 /cu.yd.	$1,713,600
F.	Buffer Layer	190,300 cu.yd.	$7.57 /cu.yd.	$1,440,571
G.	Drainage Piping			
	1. 4" PVC	4,200 l.f.	$2.79 /l.f.	$11,718
	2. 6" PVC	1,000 l.f.	$4.00 /l.f.	$4,000
H.	Fertilizer	2,522.6 M.S.F.*	$11.05 /M.S.F.*	$27,875
I.	Seeding**	2,522.6 M.S.F.*	$20.00 /M.S.F.*	$50,452
	TOTAL CAPITAL COST			$5,121,000

TABLE B2–2 (cont.)
COST MODULE
SINGLE BARRIER SOLID WASTE CAP
Himco Dump Superfund Site
Elkhart, Indiana

	QUANTITY	UNIT COST	COST
II. ANNUAL OPERATION AND MAINTENANCE COST			
A. Maintain Cover			
1. Topsoil replacement	1 year	$35,200.00 /year	$35,200
2. Seeding and fertilizing**	1 year	$27,700.00 /year	$27,700
B. 5–Year Review	1 year	$815.00 /year	$815
TOTAL ANNUAL O&M COST			$64,000

* M.S.F.= 1000 square feet
** Seeding with the prairie assemblage currently existing at this site may be considered during the design phase.

TABLE B2–3
COST MODULE
COMPOSITE BARRIER SOLID WASTE CAP
Himco Dump Superfund Site
Elkhart, Indiana

I.	CAPITAL COST	QUANTITY	UNIT COST	COST
	A. Mobilization/Demobilization	1	$10,000.00 l.s.	$10,000
	B. Clearing and Grubbing	57.9 acres	$710.00 /acre	$41,109
	C. Topsoil	154,000 cu.yd.	$9.29 /cu.yd.	$1,430,660
	D. Drainage Layer	53,700 cu.yd.	$7.29 /cu.yd.	$391,473
	E. Liner	2,522,600 sq.ft.	$0.40 /sq.ft.	$1,009,040
	F. Clay Cap Layer	224,000 cu.yd.	$7.65 /cu.yd.	$1,713,600
	G. Buffer Layer	190,300 cu.yd.	$7.57 /cu.yd.	$1,440,571
	H. Drainage Layer			
	1. 4" PVC	4,200 l.f.	$2.79 /l.f.	$11,718
	2. 6" PVC	1,000 l.f.	$4.00 /l.f.	$4,000
	H. Fertilizer	2,522.6 M.S.F.*	$11.05 /M.S.F.*	$27,875
	I. Seeding**	2,522.6 M.S.F.*	$20.00 /M.S.F.*	$50,452
	TOTAL CAPITAL COST			$6,130,000

TABLE B2–3 (cont.)
COST MODULE
COMPOSITE BARRIER SOLID WASTE CAP
Himco Dump Superfund Site
Elkhart, Indiana

	QUANTITY	UNIT COST	COST
II. ANNUAL OPERATION AND MAINTENANCE COST			
A. Maintain Cover			
1. Topsoil replacement	1 year	$35,200.00 /year	$35,200
2. Seeding and fertilizing**	1 year	$27,700.00 /year	$27,700
B. 5–Year Review	1 year	$815.00 /year	$815
TOTAL ANNUAL O&M COST			$64,000

* M.S.F. = 1000 square feet
** Seeding with the prairie assemblage currently existing at this site may be considered during the design phase.

TABLE B2–4
COST MODULE
ACTIVE GAS COLLECTION & TREATMENT
Himco Dump Superfund Site
Elkhart, Indiana

I. CAPITAL COST	QUANTITY	UNIT COST	COST
A. Gas Well Installation			
1. Mobilization/Demobilization	1	$1,600.00 l.s.	$1,600
2. Operator	11 days	$1,375.00 /day	$15,125
3. Per Diem	11 days	$130.00 /day	$1,430
4. Rental Fee	11 days	$95.00 /day	$1,045
B. Piping			
1. Screen & riser	640 l.f.	$22.75 /l.f.	$14,560
2. Header pipe (3" PVC)	7,000 l.f.	$10.01 /l.f.	$70,070
3. Header pipe (4" PVC)	3,000 l.f.	$12.23 /l.f.	$36,690
4. Trenching	1,000 l.f.	$7.60 /l.f.	$7,600
C. Grouting	32 wells	$368.00 /well	$11,776
D. Vapor Phase Carbon Adsorption	4 units	$1,200.00 /unit	$4,800
E. Structural Support	1 support	$22,500.00 /support	$22,500
F. Vacuum Pump/Blower	1 unit	$18,000.00 /unit	$18,000
G. Primary electrical power	1	$13,000.00 l.s.	$13,000
H. Secondary electrical power	1	$40,000.00 l.s.	$40,000
I. Area lighting and service power	1	$2,000.00 l.s.	$2,000
J. Instruments, alarms, and auxillary controls	1	$6,000.00 l.s.	$6,000

TABLE B2–4 (cont.)
COST MODULE
ACTIVE GAS COLLECTION & TREATMENT
Himco Dump Superfund Site
Elkhart, Indiana

I. CAPITAL COST (cont.)	QUANTITY	UNIT COST	COST
K. Electric pipe tracing, and controls	1	$2,000.00 l.s.	$2,000
L. Start–up Sampling	4 samples	$340.00 /sample	$1,360
M. Activated Carbon Disposal Fee	1	$1,000.00 l.s.	$1,000
TOTAL CAPITAL COST			$271,000
II. ANNUAL OPERATION AND MAINTENANCE COST			
A. Sampling and Analysis	8 samples	$340.00 /sample	$2,720
B. Operating Costs			
1. VPAC changes	8 changes	$2,350.00 /change	$18,800
2. Labor	260 days	$40.00 /day	$10,400
3. Gas well installation	1	$1,600.00 /year	$1,600
4. Electric Utilization	193000 kw–hr	$0.10 /kw–hr	$19,300
C. Equipment Maintenance	1 year	$5,000.00 /year	$5,000
TOTAL ANNUAL O&M COST			$58,000

TABLE B2–5
COST MODULE
LEACHATE COLLECTION SYSTEM WITH SINGLE BARRIER CAP
Himco Dump Superfund Site
Elkhart, Indiana

I. CAPITAL COST	QUANTITY	UNIT COST	COST
A. Leachate Collection Well Installation			
1. Mobilization/Demobilization	1	$1,600.00 l.s.	$1,600
2. Operator	150 days	$1,375.00 /day	$206,250
3. Per Diem	150 days	$130.00 /day	$19,500
4. Rental Fee	150 days	$95.00 /day	$14,250
5. Screen & riser	13600 l.f.	$22.75 /l.f.	$309,400
6. Grouting	680 wells	$368.00 /well	$250,240
B. Header Piping			
1. 1 1/2" PVC	41,400 l.f.	$6.98 /l.f.	$288,972
2. 2" PVC	550 l.f.	$7.89 /l.f.	$4,340
3. 3" PVC	550 l.f.	$10.01 /l.f.	$5,506
4. 4" PVC	700 l.f.	$12.23 /l.f.	$8,561
5. Trenching	1,000 l.f.	$7.60 /l.f.	$7,600
C. Air Piping			
1. 1" Steel	39,900 l.f.	$7.70 /l.f.	$307,230
2. 1 1/2" Steel	500 l.f.	$9.65 /l.f.	$4,825
3. 2" Steel	550 l.f.	$12.35 /l.f.	$6,793
4. 3" Steel	550 l.f.	$21.00 /l.f.	$11,550
5. 4" Steel	700 l.f.	$28.00 /l.f.	$19,600
6. Trenching	1,000 l.f.	$7.60 /l.f.	$7,600
D. Air Compressor/ Receiving Tank			
1. Air compressor	1 unit	$7,000.00 /unit	$7,000
2. Receiving tank	1 unit	$2,500.00 /unit	$2,500

TABLE B2–5 (cont.)
COST MODULE
LEACHATE COLLECTION SYSTEM WITH SINGLE BARRIER CAP
Himco Dump Superfund Site
Elkhart, Indiana

I.	CAPITAL COST (cont.)	QUANTITY	UNIT COST	COST
	E. Pipe Tracing	1	$1,000.00 l.s.	$1,000
	F. Ejector Pumps	680 units	$4,000.00 /unit	$2,720,000
	G. Building	1	$45,000.00 l.s.	$45,000
	H. Secondary Electrical Distribution	1	$50,000.00 l.s.	$50,000
	I. Area lighting and service power	1	$19,300.00 l.s.	$19,300
	J. Instruments, alarms, and controls	1	$12,000.00 l.s.	$12,000
	K. Electric pipe tracing and controls	400 l.f.	$5.00 /l.f.	$2,000
	L. Ventilation unit	1 unit	$4,000.00 /unit	$4,000
	M. FRP Storage Tanks	3 units	$13,050.00 /unit	$39,150
	N. Gate valves	10 units	$830.00 /unit	$8,300
	O. Centrifugal Pump	1 unit	$5,650.00 /unit	$5,650
	P. Leachate distribution piping	150 l.f.	$21.00 /l.f.	$3,150
	Q. Start–up Sampling	10 samples	$1,900.00 /sample	$19,000
	TOTAL CAPITAL COST			$4,412,000

TABLE B2–5 (cont.)
COST MODULE
LEACHATE COLLECTION SYSTEM WITH SINGLE BARRIER CAP
Himco Dump Superfund Site
Elkhart, Indiana

		QUANTITY	UNIT COST	COST
II.	ANNUAL OPERATION AND MAINTENANCE COST			
	A. Electric Utilization	129000 kw–hr	$0.10 /kw–hr	$12,900
	B. Sampling and Analysis	8 samples	$1,900.00 /sample	$15,200
	C. Leachate Transportation and Disposal	1,880,000 gallons	$0.35 /gallon	$658,000
	D. Equipment Maintenance	1	$2,000.00 /year	$2,000
	E. Operating Labor	2,100 hours	$40.00 /hour	$84,000
	TOTAL ANNUAL O&M COST			$772,000

APPENDIX B3

COST SENSITIVITY ANALYSIS

TABLE 4–1
COST FOR ALTERNATIVE 1 – NO ACTION
CAPITAL AND O&M COST
Himco Dump Superfund Site
Elkhart, Indiana

I.	CAPITAL COST	$0
	No capital costs associated with this alternative.	
II.	ANNUAL O&M COST	$0
	No operation and maintenance costs associated with this alternative.	

TABLE 4–2
COST FOR ALTERNATIVE 2 – SINGLE BARRIER CAP, ACTIVE GAS COLLECTION & TREATMENT, GROUNDWATER MONITORING, & INSTITUTIONAL CONTROL CAPITAL AND O&M COST
Himco Dump Superfund Site
Elkhart, Indiana

I.	CAPITAL COST	
	A. Institutional Control and Groundwater Monitoring	$71,000
	B. Single Barrier Solid Waste Cap	$5,121,000
	C. Active Gas Collection & Treatment	$271,000
	SUBTOTAL CAPITAL COST	$5,463,000
	Engineering (10%)	$546,300
	Construction Oversight (3%)	$163,890
	Contingencies (25%)	$1,365,750
	TOTAL CAPITAL COST	$7,539,000
II.	ANNUAL O&M COST	
	A. Institutional Control and Groundwater Monitoring	$88,000
	B. Single Barrier Solid Waste Cap	$64,000
	C. Active Gas Collection & Treatment	$58,000
	TOTAL ANNUAL O&M COST	$210,000
III.	PRESENT WORTH 30–YEAR O&M COST	$2,890,000
IV.	TOTAL PRESENT WORTH COST	$10,429,000

TABLE 4–3
COST FOR ALTERNATIVE 3 – SINGLE BARRIER CAP, ACTIVE GAS COLLECTION & TREATMENT, LEACHATE COLLECTION SYSTEM, GROUNDWATER MONITORING, & INSTITUTIONAL CONTROL
CAPITAL AND O&M COST
Himco Dump Superfund Site
Elkhart, Indiana

I.	CAPITAL COST	
	A. Institutional Control and Groundwater Monitoring	$71,000
	B. Single Barrier Cap	$5,121,000
	C. Active Gas Collection & Treatment	$271,000
	D. Leachate Collection System	$4,412,000
	SUBTOTAL CAPITAL COST	$9,875,000
	Engineering (10%)	$987,500
	Construction Oversight (3%)	$296,250
	Contingencies (25%)	$2,468,750
	TOTAL CAPITAL COST	$13,628,000
II.	ANNUAL O&M COST	
	A. Institutional Control and Groundwater Monitoring	$88,000
	B. Single Barrier Cap	$64,000
	C. Active Gas Collection & Treatment	$58,000
	D. Leachate Collection System	$772,000
	TOTAL ANNUAL O&M COST	$982,000
III.	PRESENT WORTH 30–YEAR O&M COST	$13,512,000
IV.	TOTAL PRESENT WORTH COST	$27,140,000

TABLE 4–4
COST FOR ALTERNATIVE 4 – COMPOSITE BARRIER CAP, ACTIVE GAS COLLECTION & TREATMENT, GROUNDWATER MONITORING, & INSTITUTIONAL CONTROL CAPITAL AND O&M COST
Himco Dump Superfund Site
Elkhart, Indiana

I.	CAPITAL COST	
	A. Institutional Control and Groundwater Monitoring	$71,000
	B. Composite Barrier Cap	$6,130,000
	C. Active Gas Collection & Treatment	$271,000
	SUBTOTAL CAPITAL COST	$6,472,000
	Engineering (10%)	$647,200
	Construction Oversight (3%)	$194,160
	Contingencies (25%)	$1,618,000
	TOTAL CAPITAL COST	$8,931,000
II.	ANNUAL O&M COST	
	A. Institutional Control and Groundwater Monitoring	$88,000
	B. Composite Barrier Cap	$64,000
	C. Active Gas Collection & Treatment	$58,000
	TOTAL ANNUAL O&M COST	$210,000
III.	PRESENT WORTH 30–YEAR O&M COST	$2,890,000
IV.	TOTAL PRESENT WORTH COST	$11,821,000

TABLE 4–7
COST SUMMARY
Himco Dump Superfund Site
Elkhart, Indiana

Alternatives	Capital Cost	Annual O&M Cost	Total Present Worth Cost*
1. No Action	$0	$0	$0
2. Single Barrier Cap, Gas Collection & Treatment, Groundwater Monitoring, & Institutional Control	$7,539,000	$210,000	$10,429,000
3. Single Barrier Cap, Gas Collection & Treatment, Leachate Collection System, Groundwater Monitoring, & Institutional Control	$13,628,000	$982,000	$27,140,000
4. Composite Barrier Cap, Gas Collection & Treatment, Groundwater Monitoring, & Institutional Control	$8,931,000	$210,000	$11,821,000

* Present worth cost based on interest(i)=6% and 30 years for O&M (see Tables 4–1 through 4–4).

TABLE 4-8
SUMMARY OF COST SENSITIVITY ANALYSIS
Himco Dump Superfund Site
Elkhart, Indiana

Alternative	Baseline Calculated PW Cost	50% Gas Volume Decrease PW Cost	50% Gas Volume Increase PW Cost	50% Lch Volume Decrease PW Cost	50% Lch Volume Increase PW Cost	Cap Design Alternative Decrease PW Cost	Cap Unit Cost Increase PW Cost
1. No Action	$0	$0	$0	$0	$0	$0	$0
2. Single Barrier Cap, Gas Collection & Treatment, Groundwater Monitoring, & Institutional Control	$10,429,000	$10,291,000	$10,552,000	$10,429,000	$10,429,000	$9,460,000	$15,226,000
3. Single Barrier Cap, Gas Collection & Treatment, Leachate Collection & Treatment, Groundwater Monitoring, & Institutional Control	$27,140,000	$27,003,000	$27,264,000	$22,613,000	$31,667,000	$26,171,000	$31,936,000
4. Composite Barrier Cap, Gas Collection & Treatment, Groundwater Monitoring, & Institutional Control	$11,821,000	$11,683,000	$11,944,000	$11,821,000	$11,821,000	$10,853,000	$16,618,000

Lch = Leachate
PW = Present Worth

Lower Limit and Upper Limit PW Cost for combined components.

Alternative	Baseline Calculated PW Cost	Lower Limit PW Cost	Upper Limit PW Cost
1. No Action	$0	$0	$0
2. Single Barrier Cap, Gas Collection & Treatment, Groundwater Monitoring, & Institutional Control	$10,429,000	$9,322,000	$15,349,000
3. Single Barrier Cap, Gas Collection & Treatment, Leachate Collection & Treatment, Groundwater Monitoring, & Institutional Control	$27,140,000	$21,507,000	$36,587,000
4. Composite Barrier Cap, Gas Collection & Treatment, Groundwater Monitoring, & Institutional Control	$11,821,000	$10,715,000	$16,741,000

SENSITIVITY ANALYSIS

Total Lower Limit Cost Summary and Alternative Tables for All Components Combined

TABLE L4–7
SENSITIVITY ANALYSIS – LOWER LIMIT
COST SUMMARY
Himco Dump Superfund Site
Elkhart, Indiana

Alternatives	Capital Cost	Annual O&M Cost	Total Present Worth Cost*
1. No Action	$0	$0	$0
2. Single Barrier Cap, Gas Collection & Treatment, Groundwater Monitoring, & Institutional Control	$6,570,000	$200,000	$9,322,000
3. Single Barrier Cap, Gas Collection & Treatment, Leachate Collection System, Groundwater Monitoring, & Institutional Control	$12,659,000	$643,000	$21,507,000
4. Composite Barrier Cap, Gas Collection & Treatment, Groundwater Monitoring, & Institutional Control	$7,963,000	$200,000	$10,715,000

* Present worth cost based on interest(i)=6% and 30 years for O&M (see Tables 4–1 through 4–4).

TABLE L4-1
SENSITIVITY ANALYSIS - LOWER LIMIT
ALTERNATIVE 1 - NO ACTION
CAPITAL AND O&M COST
Himco Dump Superfund Site
Elkhart, Indiana

I.	CAPITAL COST	$0
	No capital costs associated with this alternative.	
II.	ANNUAL O&M COST	$0
	No operation and maintenance costs associated with this alternative.	

TABLE L4–2
SENSITIVITY ANALYSIS – LOWER LIMIT
COST FOR ALTERNATIVE 2 – SINGLE BARRIER CAP,
ACTIVE GAS COLLECTION & TREATMENT,
GROUNDWATER MONITORING, & INSTITUTIONAL CONTROL
CAPITAL AND O&M COST
Himco Dump Superfund Site
Elkhart, Indiana

I.	CAPITAL COST	
	A. Institutional Control and Groundwater Monitoring	$71,000
	B. Single Barrier Solid Waste Cap	$4,419,000
	C. Active Gas Collection & Treatment	$271,000
	SUBTOTAL CAPITAL COST	$4,761,000
	Engineering (10%)	$476,100
	Construction Oversight (3%)	$142,830
	Contingencies (25%)	$1,190,250
	TOTAL CAPITAL COST	$6,570,000
II.	ANNUAL O&M COST	
	A. Institutional Control and Groundwater Monitoring	$88,000
	B. Single Barrier Solid Waste Cap	$64,000
	C. Active Gas Collection & Treatment	$48,000
	TOTAL ANNUAL O&M COST	$200,000
III.	PRESENT WORTH 30–YEAR O&M COST	$2,752,000
IV.	TOTAL PRESENT WORTH COST	$9,322,000

TABLE L4-3
SENSITIVITY ANALYSIS – LOWER LIMIT
COST FOR ALTERNATIVE 3 – SINGLE BARRIER CAP,
ACTIVE GAS COLLECTION & TREATMENT,
LEACHATE COLLECTION SYSTEM,
GROUNDWATER MONITORING, & INSTITUTIONAL CONTROL
CAPITAL AND O&M COST
Himco Dump Superfund Site
Elkhart, Indiana

I.	CAPITAL COST	
	A. Institutional Control and Groundwater Monitoring	$71,000
	B. Single Barrier Cap	$4,419,000
	C. Active Gas Collection & Treatment	$271,000
	D. Leachate Collection System	$4,412,000
	SUBTOTAL CAPITAL COST	$9,173,000
	Engineering (10%)	$917,300
	Construction Oversight (3%)	$275,190
	Contingencies (25%)	$2,293,250
	TOTAL CAPITAL COST	$12,659,000
II.	ANNUAL O&M COST	
	A. Institutional Control and Groundwater Monitoring	$88,000
	B. Single Barrier Cap	$64,000
	C. Active Gas Collection & Treatment	$48,000
	D. Leachate Collection System	$443,000
	TOTAL ANNUAL O&M COST	$643,000
III.	PRESENT WORTH 30-YEAR O&M COST	$8,848,000
IV.	TOTAL PRESENT WORTH COST	$21,507,000

TABLE L4–4
SENSITIVITY ANALYSIS – LOWER LIMIT
COST FOR ALTERNATIVE 4 – COMPOSITE BARRIER CAP,
ACTIVE GAS COLLECTION & TREATMENT,
GROUNDWATER MONITORING, & INSTITUTIONAL CONTROL
CAPITAL AND O&M COST
Himco Dump Superfund Site
Elkhart, Indiana

I.	CAPITAL COST	
	A. Institutional Control and Groundwater Monitoring	$71,000
	B. Composite Barrier Cap	$5,428,000
	C. Active Gas Collection & Treatment	$271,000
	SUBTOTAL CAPITAL COST	$5,770,000
	Engineering (10%)	$577,000
	Construction Oversight (3%)	$173,100
	Contingencies (25%)	$1,442,500
	TOTAL CAPITAL COST	$7,963,000
II.	ANNUAL O&M COST	
	A. Institutional Control and Groundwater Monitoring	$88,000
	B. Composite Barrier Cap	$64,000
	C. Active Gas Collection & Treatment	$48,000
	TOTAL ANNUAL O&M COST	$200,000
III.	PRESENT WORTH 30–YEAR O&M COST	$2,752,000
IV.	TOTAL PRESENT WORTH COST	$10,715,000

SENSITIVITY ANALYSIS

Total Upper Limit Cost Summary and Alternative Tables for All Components Combined

TABLE U4–7
SENSITIVITY ANALYSIS – UPPER LIMIT
COST SUMMARY
Himco Dump Superfund Site
Elkhart, Indiana

Alternatives	Capital Cost	Annual O&M Cost	Total Present Worth Cost*
1. No Action	$0	$0	$0
2. Single Barrier Cap, Gas Collection & Treatment, Groundwater Monitoring, & Institutional Control	$12,336,000	$219,000	$15,349,000
3. Single Barrier Cap, Gas Collection & Treatment, Leachate Collection System, Groundwater Monitoring, & Institutional Control	$18,424,000	$1,320,000	$36,587,000
4. Composite Barrier Cap, Gas Collection & Treatment, Groundwater Monitoring, & Institutional Control	$13,728,000	$219,000	$16,741,000

* Present worth cost based on interest(i)=6% and 30 years for O&M (see Tables 4–1 through 4–4).

TABLE U4–1
SENSITIVITY ANALYSIS – UPPER LIMIT
COST FOR ALTERNATIVE 1 – NO ACTION
CAPITAL AND O&M COST
Himco Dump Superfund Site
Elkhart, Indiana

I.	CAPITAL COST	$0
	No capital costs associated with this alternative.	
II.	ANNUAL O&M COST	$0
	No operation and maintenance costs associated with this alternative.	

TABLE U4–2
SENSITIVITY ANALYSIS – UPPER LIMIT
COST FOR ALTERNATIVE 2 – SINGLE BARRIER CAP,
ACTIVE GAS COLLECTION & TREATMENT,
GROUNDWATER MONITORING, & INSTITUTIONAL CONTROL
CAPITAL AND O&M COST
Himco Dump Superfund Site
Elkhart, Indiana

I.	CAPITAL COST	
	A. Institutional Control and Groundwater Monitoring	$71,000
	B. Single Barrier Solid Waste Cap	$8,597,000
	C. Active Gas Collection & Treatment	$271,000
	SUBTOTAL CAPITAL COST	$8,939,000
	Engineering (10%)	$893,900
	Construction Oversight (3%)	$268,170
	Contingencies (25%)	$2,234,750
	TOTAL CAPITAL COST	$12,336,000
II.	ANNUAL O&M COST	
	A. Institutional Control and Groundwater Monitoring	$88,000
	B. Single Barrier Solid Waste Cap	$64,000
	C. Active Gas Collection & Treatment	$67,000
	TOTAL ANNUAL O&M COST	$219,000
III.	PRESENT WORTH 30–YEAR O&M COST	$3,013,000
IV.	TOTAL PRESENT WORTH COST	$15,349,000

TABLE U4–3
SENSITIVITY ANALYSIS – UPPER LIMIT
COST FOR ALTERNATIVE 3 – SINGLE BARRIER CAP,
ACTIVE GAS COLLECTION & TREATMENT,
LEACHATE COLLECTION SYSTEM,
GROUNDWATER MONITORING, & INSTITUTIONAL CONTROL
CAPITAL AND O&M COST
Himco Dump Superfund Site
Elkhart, Indiana

I.	CAPITAL COST	
	A. Institutional Control and Groundwater Monitoring	$71,000
	B. Single Barrier Cap	$8,597,000
	C. Active Gas Collection & Treatment	$271,000
	D. Leachate Collection System	$4,412,000
	SUBTOTAL CAPITAL COST	$13,351,000
	Engineering (10%)	$1,335,100
	Construction Oversight (3%)	$400,530
	Contingencies (25%)	$3,337,750
	TOTAL CAPITAL COST	$18,424,000
II.	ANNUAL O&M COST	
	A. Institutional Control and Groundwater Monitoring	$88,000
	B. Single Barrier Cap	$64,000
	C. Active Gas Collection & Treatment	$67,000
	D. Leachate Collection System	$1,101,000
	TOTAL ANNUAL O&M COST	$1,320,000
III.	PRESENT WORTH 30–YEAR O&M COST	$18,163,000
IV.	TOTAL PRESENT WORTH COST	$36,587,000

TABLE U4–4
SENSITIVITY ANALYSIS – UPPER LIMIT
COST FOR ALTERNATIVE 4 – COMPOSITE BARRIER CAP,
ACTIVE GAS COLLECTION & TREATMENT,
GROUNDWATER MONITORING, & INSTITUTIONAL CONTROL
CAPITAL AND O&M COST
Himco Dump Superfund Site
Elkhart, Indiana

I.	CAPITAL COST	
	A. Institutional Control and Groundwater Monitoring	$71,000
	B. Composite Barrier Cap	$9,606,000
	C. Active Gas Collection & Treatment	$271,000
	SUBTOTAL CAPITAL COST	$9,948,000
	Engineering (10%)	$994,800
	Construction Oversight (3%)	$298,440
	Contingencies (25%)	$2,487,000
	TOTAL CAPITAL COST	$13,728,000
II.	ANNUAL O&M COST	
	A. Institutional Control and Groundwater Monitoring	$88,000
	B. Composite Barrier Cap	$64,000
	C. Active Gas Collection & Treatment	$67,000
	TOTAL ANNUAL O&M COST	$219,000
III.	PRESENT WORTH 30–YEAR O&M COST	$3,013,000
IV.	TOTAL PRESENT WORTH COST	$16,741,000

SENSITIVITY ANALYSIS

Tables Affected by 50%/150%
Gas Volume Decrease/Increase

TABLE L4-7
GAS SENSITIVITY ANALYSIS - LOWER LIMIT
COST SUMMARY
Himco Dump Superfund Site
Elkhart, Indiana

Alternatives	Capital Cost	Annual O&M Cost	Total Present Worth Cost*
1. No Action	$0	$0	$0
2. Single Barrier Cap, Gas Collection & Treatment, Groundwater Monitoring, & Institutional Control	$7,539,000	$200,000	$10,291,000
3. Single Barrier Cap, Gas Collection & Treatment, Leachate Collection System, Groundwater Monitoring, & Institutional Control	$13,628,000	$972,000	$27,003,000
4. Composite Barrier Cap, Gas Collection & Treatment, Groundwater Monitoring, & Institutional Control	$8,931,000	$200,000	$11,683,000

* Present worth cost based on interest(i)=6% and 30 years for O&M (see Tables 4-1 through 4-4).

TABLE BL2-4
SENSITIVITY ANALYSIS - LOWER LIMIT
COST MODULE
ACTIVE GAS COLLECTION & TREATMENT
Himco Dump Superfund Site
Elkhart, Indiana

I. CAPITAL COST	QUANTITY	UNIT COST	COST
A. Gas Well Installation			
1. Mobilization/Demobilization	1	$1,600.00 l.s.	$1,600
2. Operator	11 days	$1,375.00 /day	$15,125
3. Per Diem	11 days	$130.00 /day	$1,430
4. Rental Fee	11 days	$95.00 /day	$1,045
B. Piping			
1. Screen & riser	640 l.f.	$22.75 /l.f.	$14,560
2. Header pipe (3" PVC)	7,000 l.f.	$10.01 /l.f.	$70,070
3. Header pipe (4" PVC)	3,000 l.f.	$12.23 /l.f.	$36,690
4. Trenching	1,000 l.f.	$7.60 /l.f.	$7,600
C. Grouting	32 wells	$368.00 /well	$11,776
D. Vapor Phase Carbon Adsorption	4 units	$1,200.00 /unit	$4,800
E. Structural Support	1 support	$22,500.00 /support	$22,500
F. Vacuum Pump/Blower	1 unit	$18,000.00 /unit	$18,000
G. Primary electrical power	1	$13,000.00 l.s.	$13,000
H. Secondary electrical power	1	$40,000.00 l.s.	$40,000
I. Area lighting and service power	1	$2,000.00 l.s.	$2,000
J. Instruments, alarms, and auxillary controls	1	$6,000.00 l.s.	$6,000

TABLE BL2–4 (cont.)
SENSITIVITY ANALYSIS – LOWER LIMIT
COST MODULE
ACTIVE GAS COLLECTION & TREATMENT
Himco Dump Superfund Site
Elkhart, Indiana

I. CAPITAL COST (cont.)	QUANTITY	UNIT COST	COST
K. Electric pipe tracing, and controls	1	$2,000.00 l.s.	$2,000
L. Start–up Sampling	4 samples	$340.00 /sample	$1,360
M. Activated Carbon Disposal Fee	1	$1,000.00 l.s.	$1,000
TOTAL CAPITAL COST			$271,000
II. ANNUAL OPERATION AND MAINTENANCE COST			
A. Sampling and Analysis	8 samples	$340.00 /sample	$2,720
B. Operating Costs			
1. VPAC changes	4 changes	$2,350.00 /change	$9,400
2. Labor	260 days	$40.00 /day	$10,400
3. Gas well installation	1	$1,600.00 /year	$1,600
4. Electric Utilization	193000 kw–hr	$0.10 /kw–hr	$19,300
C. Equipment Maintenance	1 year	$5,000.00 /year	$5,000
TOTAL ANNUAL O&M COST			$48,000

TABLE U4–7
GAS SENSITIVITY ANALYSIS – UPPER LIMIT
COST SUMMARY
Himco Dump Superfund Site
Elkhart, Indiana

Alternatives	Capital Cost	Annual O&M Cost	Total Present Worth Cost*
1. No Action	$0	$0	$0
2. Single Barrier Cap, Gas Collection & Treatment, Groundwater Monitoring, & Institutional Control	$7,539,000	$219,000	$10,552,000
3. Single Barrier Cap, Gas Collection & Treatment, Leachate Collection System, Groundwater Monitoring, & Institutional Control	$13,628,000	$991,000	$27,264,000
4. Composite Barrier Cap, Gas Collection & Treatment, Groundwater Monitoring, & Institutional Control	$8,931,000	$219,000	$11,944,000

* Present worth cost based on interest(i)=6% and 30 years for O&M (see Tables 4–1 through 4–4).

TABLE BU2-4
SENSITIVITY ANALYSIS - UPPER LIMIT
COST MODULE
ACTIVE GAS COLLECTION & TREATMENT
Himco Dump Superfund Site
Elkhart, Indiana

I. CAPITAL COST	QUANTITY	UNIT COST	COST
A. Gas Well Installation			
1. Mobilization/Demobilization	1	$1,600.00 l.s.	$1,600
2. Operator	11 days	$1,375.00 /day	$15,125
3. Per Diem	11 days	$130.00 /day	$1,430
4. Rental Fee	11 days	$95.00 /day	$1,045
B. Piping			
1. Screen & riser	640 l.f.	$22.75 /l.f.	$14,560
2. Header pipe (3" PVC)	7,000 l.f.	$10.01 /l.f.	$70,070
3. Header pipe (4" PVC)	3,000 l.f.	$12.23 /l.f.	$36,690
4. Trenching	1,000 l.f.	$7.60 /l.f.	$7,600
C. Grouting	32 wells	$368.00 /well	$11,776
D. Vapor Phase Carbon Adsorption	4 units	$1,200.00 /unit	$4,800
E. Structural Support	1 support	$22,500.00 /support	$22,500
F. Vacuum Pump/Blower	1 unit	$18,000.00 /unit	$18,000
G. Primary electrical power	1	$13,000.00 l.s.	$13,000
H. Secondary electrical power	1	$40,000.00 l.s.	$40,000
I. Area lighting and service power	1	$2,000.00 l.s.	$2,000
J. Instruments, alarms, and auxillary controls	1	$6,000.00 l.s.	$6,000

TABLE BU2–4 (cont.)
SENSITIVITY ANALYSIS – UPPER LIMIT
COST MODULE
ACTIVE GAS COLLECTION & TREATMENT
Himco Dump Superfund Site
Elkhart, Indiana

I. CAPITAL COST (cont.)	QUANTITY	UNIT COST	COST
K. Electric pipe tracing, and controls	1	$2,000.00 l.s.	$2,000
L. Start–up Sampling	4 samples	$340.00 /sample	$1,360
M. Activated Carbon Disposal Fee	1	$1,000.00 l.s.	$1,000
TOTAL CAPITAL COST			$271,000
II. ANNUAL OPERATION AND MAINTENANCE COST			
A. Sampling and Analysis	8 samples	$340.00 /sample	$2,720
B. Operating Costs			
1. VPAC changes	12 changes	$2,350.00 /change	$28,200
2. Labor	260 days	$40.00 /day	$10,400
3. Gas well installation	1	$1,600.00 /year	$1,600
4. Electric Utilization	193000 kw–hr	$0.10 /kw–hr	$19,300
C. Equipment Maintenance	1 year	$5,000.00 /year	$5,000
TOTAL ANNUAL O&M COST			$67,000

SENSITIVITY ANALYSIS

Tables Affected by Leachate Generation Rate Change - Lower Limit/Upper Limit

TABLE L4–7
LEACHATE SENSITIVITY ANALYSIS – LOWER LIMIT
COST SUMMARY
Himco Dump Superfund Site
Elkhart, Indiana

Alternatives	Capital Cost	Annual O&M Cost	Total Present Worth Cost*
1. No Action	$0	$0	$0
2. Single Barrier Cap, Gas Collection & Treatment, Groundwater Monitoring, & Institutional Control	$7,539,000	$210,000	$10,429,000
3. Single Barrier Cap, Gas Collection & Treatment, Leachate Collection System, Groundwater Monitoring, & Institutional Control	$13,628,000	$653,000	$22,613,000
4. Composite Barrier Cap, Gas Collection & Treatment, Groundwater Monitoring, & Institutional Control	$8,931,000	$210,000	$11,821,000

* Present worth cost based on interest(i)=6% and 30 years for O&M (see Tables 4–1 through 4–4).

TABLE BL2–5
SENSITIVITY ANALYSIS – LOWER LIMIT
COST MODULE
LEACHATE COLLECTION SYSTEM WITH SINGLE BARRIER CAP
Himco Dump Superfund Site
Elkhart, Indiana

I. CAPITAL COST	QUANTITY	UNIT COST	COST
A. Leachate Collection Well Installation			
1. Mobilization/Demobilization	1	$1,600.00 l.s.	$1,600
2. Operator	150 days	$1,375.00 /day	$206,250
3. Per Diem	150 days	$130.00 /day	$19,500
4. Rental Fee	150 days	$95.00 /day	$14,250
5. Screen & riser	13,600 l.f.	$22.75 /l.f.	$309,400
6. Grouting	680 wells	$368.00 /well	$250,240
B. Header Piping			
1. 1 1/2" PVC	41,400 l.f.	$6.98 /l.f.	$288,972
2. 2" PVC	550 l.f.	$7.89 /l.f.	$4,340
3. 3" PVC	550 l.f.	$10.01 /l.f.	$5,506
4. 4" PVC	700 l.f.	$12.23 /l.f.	$8,561
5. Trenching	1,000 l.f.	$7.60 /l.f.	$7,600
C. Air Piping			
1. 1" Steel	39,900 l.f.	$7.70 /l.f.	$307,230
2. 1 1/2" Steel	500 l.f.	$9.65 /l.f.	$4,825
3. 2" Steel	550 l.f.	$12.35 /l.f.	$6,793
4. 3" Steel	550 l.f.	$21.00 /l.f.	$11,550
5. 4" Steel	700 l.f.	$28.00 /l.f.	$19,600
6. Trenching	1,000 l.f.	$7.60 /l.f.	$7,600
D. Air Compressor/ Receiving Tank			
1. Air compressor	1 unit	$7,000.00 /unit	$7,000
2. Receiving tank	1 unit	$2,500.00 /unit	$2,500

TABLE BL2–5 (cont.)
SENSITIVITY ANALYSIS – LOWER LIMIT
COST MODULE
LEACHATE COLLECTION SYSTEM WITH SINGLE BARRIER CAP
Himco Dump Superfund Site
Elkhart, Indiana

I. CAPITAL COST (cont.)	QUANTITY	UNIT COST	COST
E. Pipe Tracing	1	$1,000.00 l.s.	$1,000
F. Ejector Pumps	680 units	$4,000.00 /unit	$2,720,000
G. Building	1	$45,000.00 l.s.	$45,000
H. Secondary Electrical Distribution	1	$50,000.00 l.s.	$50,000
I. Area lighting and service power	1	$19,300.00 l.s.	$19,300
J. Instruments, alarms, and controls	1	$12,000.00 l.s.	$12,000
K. Electric pipe tracing and controls	400 l.f.	$5.00 /l.f.	$2,000
L. Ventilation unit	1 unit	$4,000.00 /unit	$4,000
M. FRP Storage Tanks	3 units	$13,050.00 /unit	$39,150
N. Gate valves	10 units	$830.00 /unit	$8,300
O. Centrifugal Pump	1 unit	$5,650.00 /unit	$5,650
P. Leachate distribution piping	150 l.f.	$21.00 /l.f.	$3,150
Q. Start–up Sampling	10 samples	$1,900.00 /sample	$19,000
TOTAL CAPITAL COST			$4,412,000

TABLE BL2–5 (cont.)
SENSITIVITY ANALYSIS – LOWER LIMIT
COST MODULE
LEACHATE COLLECTION SYSTEM WITH SINGLE BARRIER CAP
Himco Dump Superfund Site
Elkhart, Indiana

		QUANTITY	UNIT COST	COST
II.	ANNUAL OPERATION AND MAINTENANCE COST			
	A. Electric Utilization	129000 kw–hr	$0.10 /kw–hr	$12,900
	B. Sampling and Analysis	8 samples	$1,900.00 /sample	$15,200
	C. Leachate Transportation and Disposal	940,000 gallons	$0.35 /gallon	$329,000
	D. Equipment Maintenance	1	$2,000.00 /year	$2,000
	E. Operating Labor	2,100 hours	$40.00 /hour	$84,000
	TOTAL ANNUAL O&M COST			$443,000

TABLE U4–7
LEACHATE SENSITIVITY ANALYSIS – UPPER LIMIT
COST SUMMARY
Himco Dump Superfund Site
Elkhart, Indiana

Alternatives	Capital Cost	Annual O&M Cost	Total Present Worth Cost*
1. No Action	$0	$0	$0
2. Single Barrier Cap, Gas Collection & Treatment, Groundwater Monitoring, & Institutional Control	$7,539,000	$210,000	$10,429,000
3. Single Barrier Cap, Gas Collection & Treatment, Leachate Collection System, Groundwater Monitoring, & Institutional Control	$13,628,000	$1,311,000	$31,667,000
4. Composite Barrier Cap, Gas Collection & Treatment, Groundwater Monitoring, & Institutional Control	$8,931,000	$210,000	$11,821,000

* Present worth cost based on interest(i)=6% and 30 years for O&M (see Tables 4–1 through 4–4).

TABLE BU2-5
SENSITIVITY ANALYSIS - UPPER LIMIT
COST MODULE
LEACHATE COLLECTION SYSTEM WITH SINGLE BARRIER CAP
Himco Dump Superfund Site
Elkhart, Indiana

I. CAPITAL COST	QUANTITY	UNIT COST	COST
A. Leachate Collection Well Installation			
1. Mobilization/Demobilization	1	$1,600.00 l.s.	$1,600
2. Operator	150 days	$1,375.00 /day	$206,250
3. Per Diem	150 days	$130.00 /day	$19,500
4. Rental Fee	150 days	$95.00 /day	$14,250
5. Screen & riser	13,600 l.f.	$22.75 /l.f.	$309,400
6. Grouting	680 wells	$368.00 /well	$250,240
B. Header Piping			
1. 1 1/2" PVC	41,400 l.f.	$6.98 /l.f.	$288,972
2. 2" PVC	550 l.f.	$7.89 /l.f.	$4,340
3. 3" PVC	550 l.f.	$10.01 /l.f.	$5,506
4. 4" PVC	700 l.f.	$12.23 /l.f.	$8,561
5. Trenching	1,000 l.f.	$7.60 /l.f.	$7,600
C. Air Piping			
1. 1" Steel	39,900 l.f.	$7.70 /l.f.	$307,230
2. 1 1/2" Steel	500 l.f.	$9.65 /l.f.	$4,825
3. 2" Steel	550 l.f.	$12.35 /l.f.	$6,793
4. 3" Steel	550 l.f.	$21.00 /l.f.	$11,550
5. 4" Steel	700 l.f.	$28.00 /l.f.	$19,600
6. Trenching	1,000 l.f.	$7.60 /l.f.	$7,600
D. Air Compressor/ Receiving Tank			
1. Air compressor	1 unit	$7,000.00 /unit	$7,000
2. Receiving tank	1 unit	$2,500.00 /unit	$2,500

TABLE BU2–5 (cont.)
SENSITIVITY ANALYSIS – UPPER LIMIT
COST MODULE
LEACHATE COLLECTION SYSTEM WITH SINGLE BARRIER CAP
Himco Dump Superfund Site
Elkhart, Indiana

I. CAPITAL COST (cont.)	QUANTITY	UNIT COST	COST
E. Pipe Tracing	1	$1,000.00 l.s.	$1,000
F. Ejector Pumps	680 units	$4,000.00 /unit	$2,720,000
G. Building	1	$45,000.00 l.s.	$45,000
H. Secondary Electrical Distribution	1	$50,000.00 l.s.	$50,000
I. Area lighting and service power	1	$19,300.00 l.s.	$19,300
J. Instruments, alarms, and controls	1	$12,000.00 l.s.	$12,000
K. Electric pipe tracing and controls	400 l.f.	$5.00 /l.f.	$2,000
L. Ventilation unit	1 unit	$4,000.00 /unit	$4,000
M. FRP Storage Tanks	3 units	$13,050.00 /unit	$39,150
N. Gate valves	10 units	$830.00 /unit	$8,300
O. Centrifugal Pump	1 unit	$5,650.00 /unit	$5,650
P. Leachate distribution piping	150 l.f.	$21.00 /l.f.	$3,150
Q. Start–up Sampling	10 samples	$1,900.00 /sample	$19,000
TOTAL CAPITAL COST			$4,412,000

TABLE BU2–5 (cont.)
SENSITIVITY ANALYSIS – UPPER LIMIT
COST MODULE
LEACHATE COLLECTION SYSTEM WITH SINGLE BARRIER CAP
Himco Dump Superfund Site
Elkhart, Indiana

		QUANTITY	UNIT COST	COST
II.	ANNUAL OPERATION AND MAINTENANCE COST			
	A. Electric Utilization	129000 kw–hr	$0.10 /kw–hr	$12,900
	B. Sampling and Analysis	8 samples	$1,900.00 /sample	$15,200
	C. Leachate Transportation and Disposal	2,820,000 gallons	$0.35 /gallon	$987,000
	D. Equipment Maintenance	1	$2,000.00 /year	$2,000
	E. Operating Labor	2,100 hours	$40.00 /hour	$84,000
	TOTAL ANNUAL O&M COST			$1,101,000

SENSITIVITY ANALYSIS

Tables Affected by an Alternative Design of the Buffer Layer for the Caps - Lower Limit

TABLE L4-7
CAP SENSITIVITY ANALYSIS – LOWER LIMIT
COST SUMMARY
Himco Dump Superfund Site
Elkhart, Indiana

Alternatives	Capital Cost	Annual O&M Cost	Total Present Worth Cost*
1. No Action	$0	$0	$0
2. Single Barrier Cap, Gas Collection & Treatment, Groundwater Monitoring, & Institutional Control	$6,570,000	$210,000	$9,460,000
3. Single Barrier Cap, Gas Collection & Treatment, Leachate Collection System, Groundwater Monitoring, & Institutional Control	$12,659,000	$982,000	$26,171,000
4. Composite Barrier Cap, Gas Collection & Treatment, Groundwater Monitoring, & Institutional Control	$7,963,000	$210,000	$10,853,000

* Present worth cost based on interest(i)=6% and 30 years for O&M (see Tables 4-1 through 4-4).

TABLE BL2–2
SENSITIVITY ANALYSIS – LOWER LIMIT
COST MODULE
SINGLE BARRIER SOLID WASTE CAP
Himco Dump Superfund Site
Elkhart, Indiana

I.	CAPITAL COST	QUANTITY	UNIT COST	COST
A.	Mobilization/Demobilization	1	$10,000.00 l.s.	$10,000
B.	Clearing and Grubbing	57.9 acres	$710.00 /acre	$41,109
C.	Topsoil	154,000 cu.yd.	$9.29 /cu.yd.	$1,430,660
D.	Drainage Layer	53,700 cu.yd.	$7.29 /cu.yd.	$391,473
E.	Clay Cap Layer	224,000 cu.yd.	$7.65 /cu.yd.	$1,713,600
F.	Buffer Layer	142,725 cu.yd.	$5.17 /cu.yd.	$737,888
G.	Drainage Piping			
	1. 4" PVC	4,200 l.f.	$2.79 /l.f.	$11,718
	2. 6" PVC	1,000 l.f.	$4.00 /l.f.	$4,000
H.	Fertilizer	2,522.6 M.S.F.*	$11.05 /M.S.F.*	$27,875
I.	Seeding**	2,522.6 M.S.F.*	$20.00 /M.S.F.*	$50,452
	TOTAL CAPITAL COST			$4,419,000

TABLE BL2–2 (cont.)
SENSITIVITY ANALYSIS – LOWER LIMIT
COST MODULE
SINGLE BARRIER SOLID WASTE CAP
Himco Dump Superfund Site
Elkhart, Indiana

	QUANTITY	UNIT COST	COST
II. ANNUAL OPERATION AND MAINTENANCE COST			
A. Maintain Cover			
1. Topsoil replacement	1 year	$35,200.00 /year	$35,200
2. Seeding and fertilizing**	1 year	$27,700.00 /year	$27,700
B. 5–Year Review	1 year	$815.00 /year	$815
TOTAL ANNUAL O&M COST			$64,000

* M.S.F.= 1000 square feet
** Seeding with the prairie assemblage currently existing at this site may be considered during the design phase.

TABLE BL2-3
SENSITIVITY ANALYSIS - LOWER LIMIT
COST MODULE
COMPOSITE BARRIER SOLID WASTE CAP
Himco Dump Superfund Site
Elkhart, Indiana

I.	CAPITAL COST	QUANTITY	UNIT COST	COST
A.	Mobilization/Demobilization	1	$10,000.00 l.s.	$10,000
B.	Clearing and Grubbing	57.9 acres	$710.00 /acre	$41,109
C.	Topsoil	154,000 cu.yd.	$9.29 /cu.yd.	$1,430,660
D.	Drainage Layer	53,700 cu.yd.	$7.29 /cu.yd.	$391,473
E.	Liner	2,522,600 sq.ft.	$0.40 /sq.ft.	$1,009,040
F.	Clay Cap Layer	224,000 cu.yd.	$7.65 /cu.yd.	$1,713,600
G.	Buffer Layer	142,725 cu.yd.	$5.17 /cu.yd.	$737,888
H.	Drainage Layer			
	1. 4" PVC	4,200 l.f.	$2.79 /l.f.	$11,718
	2. 6" PVC	1,000 l.f.	$4.00 /l.f.	$4,000
H.	Fertilizer	2,522.6 M.S.F.*	$11.05 /M.S.F.*	$27,875
I.	Seeding**	2,522.6 M.S.F.*	$20.00 /M.S.F.*	$50,452
	TOTAL CAPITAL COST			$5,428,000

TABLE BL2–3 (cont.)
SENSITIVITY ANALYSIS – LOWER LIMIT
COST MODULE
COMPOSITE BARRIER SOLID WASTE CAP
Himco Dump Superfund Site
Elkhart, Indiana

	QUANTITY	UNIT COST	COST
II. ANNUAL OPERATION AND MAINTENANCE COST			
A. Maintain Cover			
1. Topsoil replacement	1 year	$35,200.00 /year	$35,200
2. Seeding and fertilizing**	1 year	$27,700.00 /year	$27,700
B. 5–Year Review	1 year	$815.00 /year	$815
TOTAL ANNUAL O&M COST			$64,000

* M.S.F = 1000 square feet
** Seeding with the prairie assemblage currently existing at this site may be considered during the design phase.

SENSITIVITY ANALYSIS

Tables Affected by Unit Cost Rates
For the Cap Components - Upper Limit

TABLE U4-7
CAP SENSITIVITY ANALYSIS – UPPER LIMIT
COST SUMMARY
Himco Dump Superfund Site
Elkhart, Indiana

Alternatives	Capital Cost	Annual O&M Cost	Total Present Worth Cost*
1. No Action	$0	$0	$0
2. Single Barrier Cap, Gas Collection & Treatment, Groundwater Monitoring, & Institutional Control	$12,336,000	$210,000	$15,226,000
3. Single Barrier Cap, Gas Collection & Treatment, Leachate Collection System, Groundwater Monitoring, & Institutional Control	$18,424,000	$982,000	$31,936,000
4. Composite Barrier Cap, Gas Collection & Treatment, Groundwater Monitoring, & Institutional Control	$13,728,000	$210,000	$16,618,000

* Present worth cost based on interest(i)=6% and 30 years for O&M (see Tables 4-1 through 4-4).

TABLE BU2–2
SENSITIVITY ANALYSIS – UPPER LIMIT
COST MODULE
SINGLE BARRIER SOLID WASTE CAP
Himco Dump Superfund Site
Elkhart, Indiana

I. CAPITAL COST	QUANTITY	UNIT COST	COST
A. Mobilization/Demobilization	1	$10,000.00 l.s.	$10,000
B. Clearing and Grubbing	57.9 acres	$710.00 /acre	$41,109
C. Topsoil	154,000 cu.yd.	$20.02 /cu.yd.	$3,083,080
D. Drainage Layer	53,700 cu.yd.	$12.22 /cu.yd.	$656,214
E. Clay Cap Layer	224,000 cu.yd.	$11.48 /cu.yd.	$2,571,520
F. Buffer Layer	190,300 cu.yd.	$11.25 /cu.yd.	$2,140,875
G. Drainage Piping			
1. 4" PVC	4,200 l.f.	$2.79 /l.f.	$11,718
2. 6" PVC	1,000 l.f.	$4.00 /l.f.	$4,000
H. Fertilizer	2,522.6 M.S.F.*	$11.05 /M.S.F.*	$27,875
I. Seeding**	2,522.6 M.S.F.*	$20.00 /M.S.F.*	$50,452
TOTAL CAPITAL COST			$8,597,000

TABLE BU2–2 (cont.)
SENSITIVITY ANALYSIS – UPPER LIMIT
COST MODULE
SINGLE BARRIER SOLID WASTE CAP
Himco Dump Superfund Site
Elkhart, Indiana

	QUANTITY	UNIT COST	COST
II. ANNUAL OPERATION AND MAINTENANCE COST			
A. Maintain Cover			
1. Topsoil replacement	1 year	$35,200.00 /year	$35,200
2. Seeding and fertilizing**	1 year	$27,700.00 /year	$27,700
B. 5–Year Review	1 year	$815.00 /year	$815
TOTAL ANNUAL O&M COST			$64,000

* M.S.F.= 1000 square feet
** Seeding with the prairie assemblage currently existing at this site may be considered during the design phase.

TABLE BU2-3
SENSITIVITY ANALYSIS - UPPER LIMIT
COST MODULE
COMPOSITE BARRIER SOLID WASTE CAP
Himco Dump Superfund Site
Elkhart, Indiana

I.	CAPITAL COST	QUANTITY	UNIT COST	COST
A.	Mobilization/Demobilization	1	$10,000.00 l.s.	$10,000
B.	Clearing and Grubbing	57.9 acres	$710.00 /acre	$41,109
C.	Topsoil	154,000 cu.yd.	$20.02 /cu.yd.	$3,083,080
D.	Drainage Layer	53,700 cu.yd.	$12.22 /cu.yd.	$656,214
E.	Liner	2,522,600 sq.ft.	$0.40 /sq.ft.	$1,009,040
F.	Clay Cap Layer	224,000 cu.yd.	$11.48 /cu.yd.	$2,571,520
G.	Buffer Layer	190,300 cu.yd.	$11.25 /cu.yd.	$2,140,875
H.	Drainage Layer			
	1. 4" PVC	4,200 l.f.	$2.79 /l.f.	$11,718
	2. 6" PVC	1,000 l.f.	$4.00 /l.f.	$4,000
H.	Fertilizer	2,522.6 M.S.F.*	$11.05 /M.S.F.*	$27,875
I.	Seeding**	2,522.6 M.S.F.*	$20.00 /M.S.F.*	$50,452
	TOTAL CAPITAL COST			$9,606,000

TABLE BU2–3 (cont.)
SENSITIVITY ANALYSIS – UPPER LIMIT
COST MODULE
COMPOSITE BARRIER SOLID WASTE CAP
Himco Dump Superfund Site
Elkhart, Indiana

	QUANTITY	UNIT COST	COST
II. ANNUAL OPERATION AND MAINTENANCE COST			
A. Maintain Cover			
1. Topsoil replacement	1 year	$35,200.00 /year	$35,200
2. Seeding and fertilizing**	1 year	$27,700.00 /year	$27,700
B. 5–Year Review	1 year	$815.00 /year	$815
TOTAL ANNUAL O&M COST			$64,000

* M.S.F = 1000 square feet
** Seeding with the prairie assemblage currently existing at this site may be considered during the design phase.

APPENDIX B4

INDEX OF TELEPHONE LOGS

Index of Telephone Logs

1. Do-it-Yourself Co. - Institutional Control
2. D&G Drilling Inc. - Drilling
3. SEC Donohue - Groundwater Monitoring
4. IEA, Inc. - Water Sample Analysis
5. Dominic's Lawn Service - Lawn Care
6. Gundle Lining Systems Inc. - Synthetic Liner
7. Calgon - VPAC
8. Pace Lab, Inc. - Air Sample Analysis
9. Dressor Industries - Blower/Pump
10. Hadley Industries - Centrifuge Pump
11. Corrosion Resistant System - FRP Storage Tanks
12. Clean Harbors - Leachate Disposal
13. SEC Donohue - Electrical Estimate
14. SEC Donohue - Building Construction
15. SEC Donohue - Building Ventilation
16. Elkhart County Gravel Corp. - Cap Material
17. Ejector Systems Inc. - Leachate Pumps
18. Chemical Waste Management - Activated Carbon Unit Disposal

VENDOR LIST

INSTITUTIONAL CONTROL
Do-it Yourself Co.
52811 Hollyhock Road
South Bend, IN 46637
James Turrell
219-272-0660

DRILLING
D&G Drilling Inc.
1037 Vine Street
New Lenox, IL 60451
Dale Koditek
815-485-3209

GROUNDWATER MONITORING
SEC Donohue Inc.
Chicago, IL
Karen Roberts
312-902-7100

WATER SAMPLE ANALYSIS
IEA, Inc.
126 West Center Court
Schaumburg, IL 60195
Linda Ercole
708-705-0740

LAWN CARE
Dominic's Lawn Service
52941 Co. Rd. 9
Elkhart, IN
Dominic
219-264-7757

SYNTHETIC LINER
Gundle Lining Systems Inc.
19103 Gundle Road
Houston, TX 77073
Ronny Ruffeno
713-443-8564

VPAC UNITS
Calgon Carbon Corporation
4343 Commerce Ct., Suite 400
Lisle, IL 60532
Shalac Chaghen
708-505-1919

AIR SAMPLE ANALYSIS
Pace, Inc. (SEC Donohue)
1710 Douglas Drive North
Minneapolis, MN 55422
Larry Deeney
612-525-3300

BLOWER/PUMP
Dressor Industries
301 Wolf Road
Franklin Park, IL
John Mattick
708-451-3900

CENTRIFUGE PUMP
Hadley Industries
5900 West 4th Street
P.O. 489
Ludington, MI 49431
Frank Smiddy
800-843-3882

FRP STORAGE TANKS
Corrosion REsistant System
5500 Rock Bluff N.E.
Commstock Park, MI
Ron Dame

LEACHATE DISPOSAL
Clean Harbors
11800 S. Stoney Island Ave.
Chicago, IL 60617
Paul Massazek
312-646-5111

ELECTRIC PIPE TRACING & CONTROLS
SEC Donohue Inc.
Schaumburg, IL
Don Berlinger

CAP MATERIAL
Elkhart County Gravel Corp.
19242 US 6
New Paris, IN 46553
Barney Baer
219-831-2518

LEACHATE PUMPS
Ejector Systems Inc.
910 National Ave.
Addison, IL 60701
Dave Oglvie
708-543-2214

ACTIVATED CARBON UNIT DISPOSAL

Chemical Waste Management
2000 South Batavia Avenue
Geneva, IL 60134
708-513-4314

INSTITUTIONAL CONTROLS

Do-it-Yourself Co.
52821 Hollyhock Rd.
South Bend, IN 46637
James Turrell
219-272-0660

SEC Donohue Staff: K. Roberts

Information given:

- 4 gates - 2 ft. opening
- 6,800 ft. of 8 ft. chain link fencing with 3 barb wires. 9 gauge

Information received:

See attached letter.

• 4 gates 20 ft. opening hung on 4" full weight post, 6,800' chain link fence 9 gauge 8 ft. with 3 barb, 2" top rail		$31,813.60
• 8 corner posts (8 @ $60.00 each)		480.00
• 8 end posts (8 @ $52.00 each)		416.00
• Installation		10,200.00
		$42,909.60
	+ Tax (5%)	2,145.48
		$45,055.08

A/R/HIMCO/AT0

J. & A. BUY LOW, INC.
52821 Hollyhock Road
South Bend, Indiana 46637
(219) 272-0660

July 8- 1992

Carron Robert
111 N. Canal St. Suite 305
Chicago, IL 60606

Dear Madam:

I regret that I did not have the information you wanted, befor you went on vacation. The hold up was on that big amount of material price had to come from the manufacture and the wholesaler. I have triedto give you most of the cost of material, there being ends and corners, not knowing how many of these you will need I will give yoy the cost of each. End Post Complete $ 52.00 3" full weight & brace
Corner Post Complete $ 60.00 3" full weight & brace

4--- Gates-- 20ft opening hung 4" full weight post
6800 ft. 8ft Chain link fence 9 ga. with 3 barb
1 5/8 top rail $ 30,595.26 PLUS SALES TAX

4-Gates 20ft opening hung on 4" full weight post
6800 ft Chain link fence 9 ga. 8ft with 3 barb
2" top rail line post 2½ "$520 in either case.
$ 31,813.60 Plus Saes Tax 5%

Labor : Not Knowing any thing about the job, but if it is not to much out from most jobs. it would be$ 10,200.00 We get $ 1.25 for 6ft with three barb, but 8ft is 2times as hard to install because you have to do every thing of of trucks we think this is a very good price. for labor

If you were wondering about the different names . Do-It-Yourself Co. is owned by J. & A. Buy Low Inc.

Yours truly

James R. Turrell

James R. Turrell

D & G Drilling Inc.

1037 VINE STREET, NEW LENOX, ILLINOIS 60451
TELEPHONE: 815-485-3209

SPECIALIST IN ALL TYPES SOIL TESTING AND ROCK CORING 30 YEARS EXPERIENCE

FAX COVER SHEET

TO: Mehdi Geraminegad
FROM: Dale Kaditek D & G Drilling, Inc.
DATE: 6-11-92
TIME: _____ FAX NO: 312-902-7099
JOB # OR LOCATION Elkhart Ind - 32-4" PVC Gas Well 10'of PVC Screen
NUMBER OF PAGES (INCLUDING COVER) 1
FAX NUMBER: (815) 485-3218
PROBLEMS, JOB SCHEDULING OR BIDDING: (815) 485-3209

Mob & de Mob	600.00
Hourly 125 P/H 8 hr min Per day	1,000.00
Over Time 1.5 Time Hourly	
Steam & Gen Rental Per day	95.00
COMMENTS: Per diem 2 man Crew Per day	130.00
4" PVC Screen	14.50 Ea
4" PVC Riser	7.50 Ea
4" Threaded Slip Caps or Plugs	15.00 Ea
Silica Sand Per bag 10.00 Ea (6 Per hole)	10.00
Bent Pellets 5/Gallon Pail 65 Ea 4 Ho	65.00
Cement Per bag (Est 4 Per hole	9.50 Ea
Bent Powder Per bag (	10.00 Ea

Mehdi I would Est 4 To 6 wells Per day depending on drilling Conditions

Dale

GROUNDWATER MONITORING

K. ROBERTS - GEOLOGIST
SEC Donohue
111 N. Canal St. Suite 305
Chicago, IL 60657

19 Water samples / sampling round

Professional Hours

Assume a 3 man crew — 2 samplers, 1 sample custodian.
Assume ~~8~~ 5 days at ~~3~~ 4 wells sampled/day.
~~2~~ 2 day at ~~2~~ 3 wells sampled/day.
1 day for travel to and from site.

~~8~~ 10 days

~~8~~ 10 days/sampling round × 10 hours/day × 3 man crew = ~~240~~ 300 hours/sample round

ODC's

Hotel = $40/night × 3 man crew = $120/night × ~~8~~ 10 days = ~~$960~~ $1200/round

Per diem = $28/day × 3 man crew = $84/day × ~~8~~ 10 days = ~~$672~~ $840/round

~~$1632~~ $2040/round

Assume equipment cost of $460/round → $468/round

Total ODC's ~~$2000~~ $2508/round

TELEPHONE CONVERSATION LOG

EPA Region V Contract No. 68-W8-0093

Project No. 20026.040 Date 7/1/92 Time 1300

Work Assignment Name (if appropriate) Himco Dump FS

Subject Cost for lab analysis.

Donohue staff K. Roberts Outside Party Linda Ercole

IEA (708) 705-0740

Made Call (✓) Meeting ( )
Rec'd Call ( ) Other ( )

cc: _____

Summary of conversation:

Cost for TAL and TCL lab analysis:

TAL & TCL Water samples: $1,182/sample

The cost per sample increases 75% with a CLP deliverable.

Cost w/CLP deliverable = $2068.50/sample

- with 5 or more samples there is a 10% discount
- with 20 or more samples there is a 15% discount

Cost with 5 or more samples 2068.50 − 206.85 = $1861.65

Comment: I will round up to $1900/sample for costing purposes.

Comments:

IEA
126 West Center Court
Schaumburg, Illinois 60195
(708) 705-0740

ARCS/FORMS/AB2

ARCS REGION V
TELEPHONE CONVERSATION LOG

EPA Region V Contract No. 68-W8-0093

Project No. 20026.040 Date 6/8/92 Time 3:45 p.m.

Work Assignment Name (if appropriate) HIMCO

Subject _____

Your name TOM SEXTON Outside Party* DOMINIC
Company SEC Donohue Agency/Company DOMINIC'S LAWN SERVICE

Made Call ( ) Rec'd Call (✓) Meeting ( ) Other ( ) _____

cc: _____

Summary of conversation:

Estimated the lawn care for 50 acres of land. The price for the service amounts to $1000.00 per cutting. The reason for the price amount is they charge $20.00 per acre.

Action Required:

Comments:

*NOTE: All telephone conversations with EPA must be recorded and copies of the conversation log forwarded to the PMO Project Manager.

ARCS/F/AB2

ARCS REGION V
TELEPHONE CONVERSATION LOG

EPA Region V Contract No. 68-W8-0093

Project No. 20026 Date 7/28 Time 3:00 p.m.

Work Assignment Name (if appropriate) Himco Dump

Subject Synthetic 40 mil liners and fabrinet drainage layers.

Your name K. ROBERTS Outside Party* Ronny Ruffeno
Company SEE DONOHUE Agency/Company Gundle Lining Systems Inc
800-435-2008

Made Call (X) Rec'd Call ( ) Meeting ( ) Other ( )

cc:

Summary of conversation:

Info given:
2,522,600 ft² ← both liners & fabrinet

Info rec'd:

Double sided 16 oz. fabrinet
$0.56/ft² installed

40 mil Liners — $0.40/ft² installed.

Action Required:

Comments:

*NOTE: All telephone conversations with EPA must be recorded and copies of the conversation log forwarded to the PMO Project Manager.

ARCS/F/AB2

TELEPHONE CONVERSATION LOG

EPA Region V Contract No. 68-W8-0093

Project No. 20026.040 Date 6/8/92 Time 3:00 p.m.

Work Assignment Name (if appropriate) HIMCO

Subject

Donohue staff TOM SEXTON Outside Party SHALEC CHAGHEN

Made Call ( ) Meeting ( )
Rec'd Call (✓) Other ( )

Calgon Carbon Corp.
(708) 505-1919

cc:

Summary of conversation:

Estimated the cost for 8 UPAC units for gas extraction wells. The price equals $4800.00. This is because each unit costs $600.00 when purchased in quantities of 4-9 UPAC's.

Comments:

ARCS/FORMS/AB2

AIR SAMPLING & ANALYSIS

PACE LAB, INC.
LARRY DEENEY

SEC Donohue Staff : K. Roberts / W. Tremel

Air sampling for timing of carbon material replacement.

$300	–	method
$40	–	tenex and cartridge sampling procedure

Total sample cost $340.00

BLOWER / PUMP

DRESSOR INDUSTRIES
JOHN MATTICK

DONOHUE STAFF: W. TREMEL

1000 SCFM:
50" w.c. vacuum inlet
150" w.c. pressure distribution

M# 616 RGST 1225 CFM

Blower 2000 RPM, 75 HP
Gas tight seals
Mill & Chem. motor

$18,000 complete

CENTRIFUGE PUMP

HADLEY INDUSTRIES
FRANK SMIDDY

DONOHUE STAFF : W. TREMEL

Pump :

4x3 150 GPM 316 SS
90-120 ft. head

$6,000 - 8,000/unit installed

FRP Storage Tanks

Corrosion Resistant System
Ron Dame

SEC Donohue Staff: W. Tremel

FRP tanks, 10 ft. diameter, 12 ft. deep (9,000 gal.)

$13,050.00/unit

TELEPHONE CONVERSATION LOG

EPA Region V Contract No. 68-W8-0093

Project No. 20026.040 Date 7/27/92 Time 9:00

Work Assignment Name (if appropriate) Himco FS

Subject Leachate transport and disposal

Donohue staff K. Roberts Outside Party Clean Harbors

Made Call (X) Meeting ( )
Rec'd Call ( ) Other ( )

Jamie Paulin
(312) 646-5111

cc:

Summary of conversation:

I faxed J. Paulin Tables 4-17 through 4-21 from the Himco Dump Remedial Investigation Report. She looked at the data and said that leachate would have to be sampled for TCLP full scan and the per gallon price for transportation and disposal would be between:

$0.25 $0.30.

J. Paulin said that this price assumes that no "F or U" codes on leachate.

Also assuming that all leachate is a liquid.

7/28, 3:00
Transportation of leachate to disposal facility in Chicago would cost $520/load. Each load would hold approx. 5,000 gal/load.
→ Site would produce ~628 loads/year
Cost of $326,726.00/year which would raise the per gallon cost $0.10
Total cost for transport and disposal of leachate $0.35-$0.40/

Comments:

ARCS/FORMS/AB2

Electric Pipe Tracing & Controls

SEC Donohue - Schaumburg
Don Berlinger

SEC Donohue Staff - Chicago : W. Tremel

200 l.f of electric pipe tracing
$5.00/l.f. or $1000 l.s.

Electrical Estimate

SEC Donohue Inc. - Schaumburg
Don Berlinger

SEC Donohue Staff - Chicago - W. Tremel

Information Received:

Primary electrical distribution — $13,000
400 l.f. – 3 wire 13,800 Vac power lines in 3" conduit w/ 13,800/480 VAC transformer

Secondary electrical distribution — $50,000
60 l.f. – 3 wire 480 Vac distribution lines in 2" conduit w/ 1 MCC unit, lighting and instrument transformers and panels, and 600 l.f. 1" conduit.

Area lighting and service power — $19,300
36 inside lighting units, 4 outside lighting units, and 400 l.f. of 1" conduit and wire.

Instruments, alarms, and auxillary controls — $12,000
Instrument and fire alarm panels, 4001.f. conduit and wire.

Electric pipe tracing and controls — $2,000
400 l.f. electric pipe tracing, conduit, and wire.

BUILDING CONSTRUCTION

SEC DONOHUE INC. – SCHAUMBURG

DON BERLINGER

1- GARAGE DOOR

2- PASSAGE DOORS

12 - WINDOWS

30' x 60' x 30' (height)

INSULATED WITH LINER PANEL

$12/ft² Building Material and erection

6.20/ft² Foundation and Site development

$18.20/ft²

$25/ft²

Building Ventilation

SEC Donohue Inc. – Schaumburg
Abbas Kaka

SEC Donohue Inc. Staff - Chicago – W. Tremel

1- Roof ventilator for building $4,000

CAP MATERIAL

ELKHART COUNTY GRAVEL CORP.
19242 US 6
NEW PARIS, IN 46553
(219)831-2815

BARNEY BEER

SEC DONOHUE STAFF : K. ROBERTS 7/17, 9:00a.m.

BArney Beer of Elkhart County Gravel Corp. informed me that large quantities of clay are hard to obtain in Northern Indiana but there are veins present. In order to get such a large quantity as we request they would probably buy a farm in the area and excavate to retrieve the clay.

Estimates for material and haul:

Clay $500/cu.yd.
TopSoil $7.00/cu.yd.
Sand $5.00/cu.yd.

ARCS REGION V
TELEPHONE CONVERSATION LOG

EPA Region V Contract No. 68-W8-0093

Project No. 20026 Date 7/31 Time 3:30

Work Assignment Name (if appropriate) Himco Dump

Subject Individual pumps for leachate

Your name K. Roberts Outside Party* Dave Galvin
Company SEC Donohue Agency/Company Ejector Systems Inc.

Made Call (X) Rec'd Call ( ) Meeting ( ) Other ( )

cc:

Summary of conversation:

Info given:
20' deep wells
low flow rate
Well diameter is 3 or 4".

Info rec'd:
Each pump would cost $4,000.
Pumping rate would be 0-1 GPM
Need one pump per well.

Action Required:

Comments:

*NOTE: All telephone conversations with EPA must be recorded and copies of the conversation log forwarded to the PMO Project Manager.

ARCS/F/AB2

ARCS REGION V
TELEPHONE CONVERSATION LOG

EPA Region V Contract No. 68-W8-0093

Project No. 20026.043 Date 9/15/92 Time 2:00 p.m.

Work Assignment Name (if appropriate) Himco Dump - FS

Subject Cost estimate for disposal of activated carbon units

Your name K. Roberts Outside Party* Sherry Bieniunga
Company SEC Donohue Agency/Company Chemical Waste Management
(708) 513-4314

Made Call (X) Rec'd Call ( ) Meeting ( ) Other ( )

cc:

Summary of conversation:

Requested: Estimate for disposal of activated carbon units

Info. given: 2 units/year — 110 gallon capacity (16 drums/year of solid waste).
- probable disposal would be incineration

Info received:
TWI: $750/55 gallon drum - disposal (incineration)
$62/" - transportation
+$0.006/lb for each 1% over 25% Cl and each 1% over 5% ash.
Emelle Alabama: $750/55 gal drum - disposal
$101/" - transportation
Port Arthur: $300-$600/55 gal drum - disposal
$131/" - transportation

All facilities require TCLP testing prior to acceptance, plus a $1,000.- approval fee for analytical & paperwork approval (one time fee).

Action Required:

Chemical Waste Management.
2000 S. Batavia Ave.
Geneva, IL 60134

Comments:

$750.00 } 1 drum } = 1 unit
750.00 } 1 drum }
124.00 transportation of 2 drums.
125.00 Sampling cost assuming
$1749.00 TCLP cost of ~$2,000 and sample needed every 2 years

Incineration of 1 unit = $1,750.00

*NOTE: All telephone conversations with EPA must be recorded and copies of the conversation log forwarded to the PMO Project Manager.

ARCS/F/AB2